

# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 169	1/4
ZEXEL No.	:	101402-0732	
Date	:	30.05.1992	[4]
Company	:	ISUZU	
Engine	:	4BD1-T/8-94420-662-2	

IP-Type number	:	101040-8520 / PES4A
Governor type number	:	105410-8301 / EP/RSV

## TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure	bar :	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure	bar :	175
Test pressure line		
Inner x Outer Dia - Length	mm :	2.00 x 6.00 x 600

## PORT CLOSING

Prestroke	mm :	3.4 ± 0.05
Rod position	mm :	-
Port closing mark	Cyl. No. :	-
Cam sequence	:	1 - 3 - 4 - 2

Port closing mark	Cyl. No. :	-
Port closing difference	°NW :	0-90-180-270

Tolerance	+ - °C:	0.50 (0.75)
-----------	---------	-------------



Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
A	10.0	1100	79.5 - 82.5	± 2	Rack	Basic
H	approx. 6.5	400	6.6 - 9.4	± 14	Rack	
A	10.0	1100	79.5 - 82.5	-	Lever	Basic

Timing Advance Specification :

Speed (rpm)						
Advance Angle (deg.)						

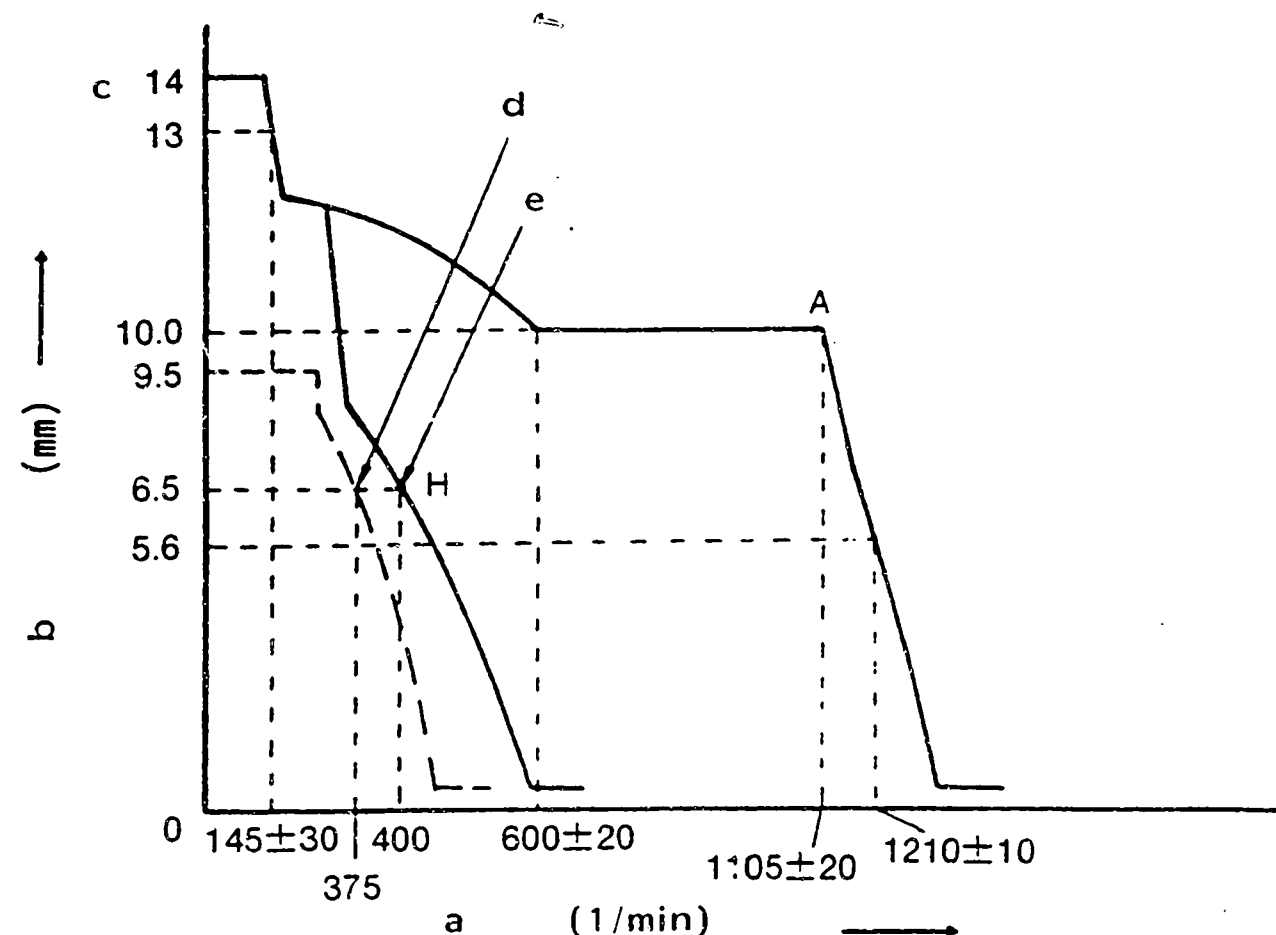


Figure 1

a = Pump speed  
b = Control rack position  
c = Above  
d = Idle-sub spring setting  
e = Governor spring setting

#### GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 5

**A = Speed control lever angle**

a = Full-speed  
b = Idling

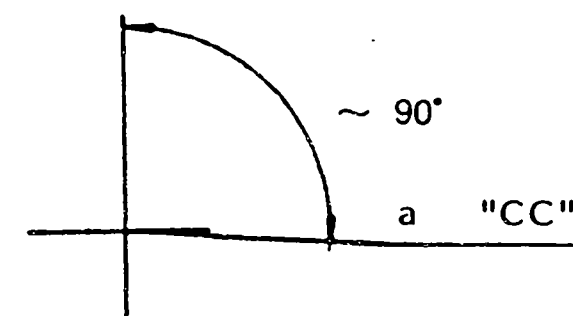
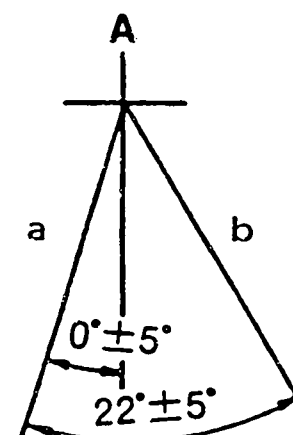
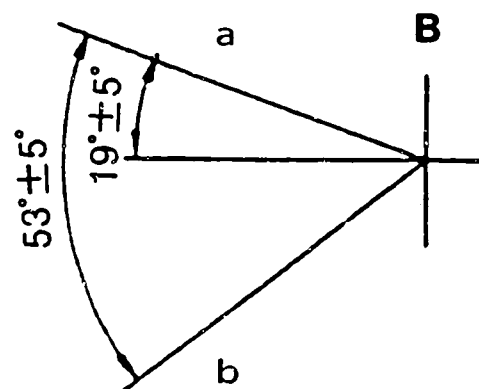


Figure 2

a = Mark

#### TIMING SETTING

At No. 1 plunger's  
beginning of injection  
position (B.T.D.C): 18°

101402-0732 2/4

**A4**

ZEXEL - Test values  
Injection pumps



**A5**

ZEXEL - Test values  
Injection pumps



## ■ Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt that the control rack position is 0.5 - 1.0 mm.

## ■ ADJUSTMENT

	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	1085 - 1125 1100	10.0 10.0	<ul style="list-style-type: none"> <li>• Adjust using screw (2)</li> <li>• Adjust using screw (1)</li> </ul>
Idling Adjustment	400 0 375	6.5 9.5 6.5	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Fix the control lever</li> <li>• Adjust using spring capsule (5)</li> </ul>
Maximum-speed Adjustment	1085 - 1125 1200 - 1220  580 - 620  - -	10.0 5.6  10.0  - -	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Confirm speed droop, adjust using screw (3)</li> <li>• Adjust using spring capsule (4)</li> <li>• Confirm</li> <li>• Confirm</li> </ul>
Full-load Adjustment	1100	10.0	<ul style="list-style-type: none"> <li>• Confirm</li> </ul>
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>• Measure the control lever angle at the "idling" and "full" positions.</li> <li>• When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Rack Limiter Adjustment	-	-	<ul style="list-style-type: none"> <li>• Adjust using screw</li> </ul>

**A6**

ZEXEL - Test values

---

Injection pumps

**A7**

ZEXEL - Test values

---

Injection pumps





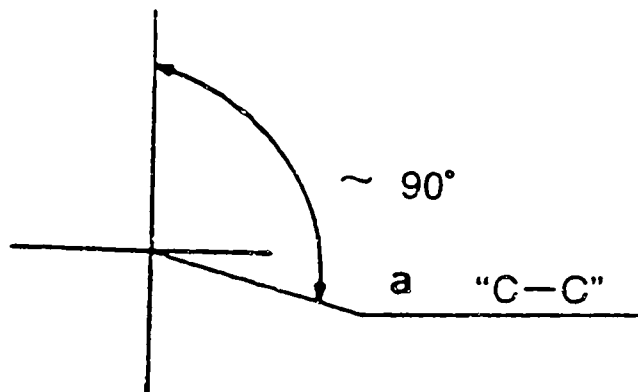


Figure 3

101402-0732 3/4  
(Continuation)

Pump center line

a = Mark

#### ■ TIMING SETTING

At No. 1 plunger's beginning of injection position.

B.T.D.C: 18°



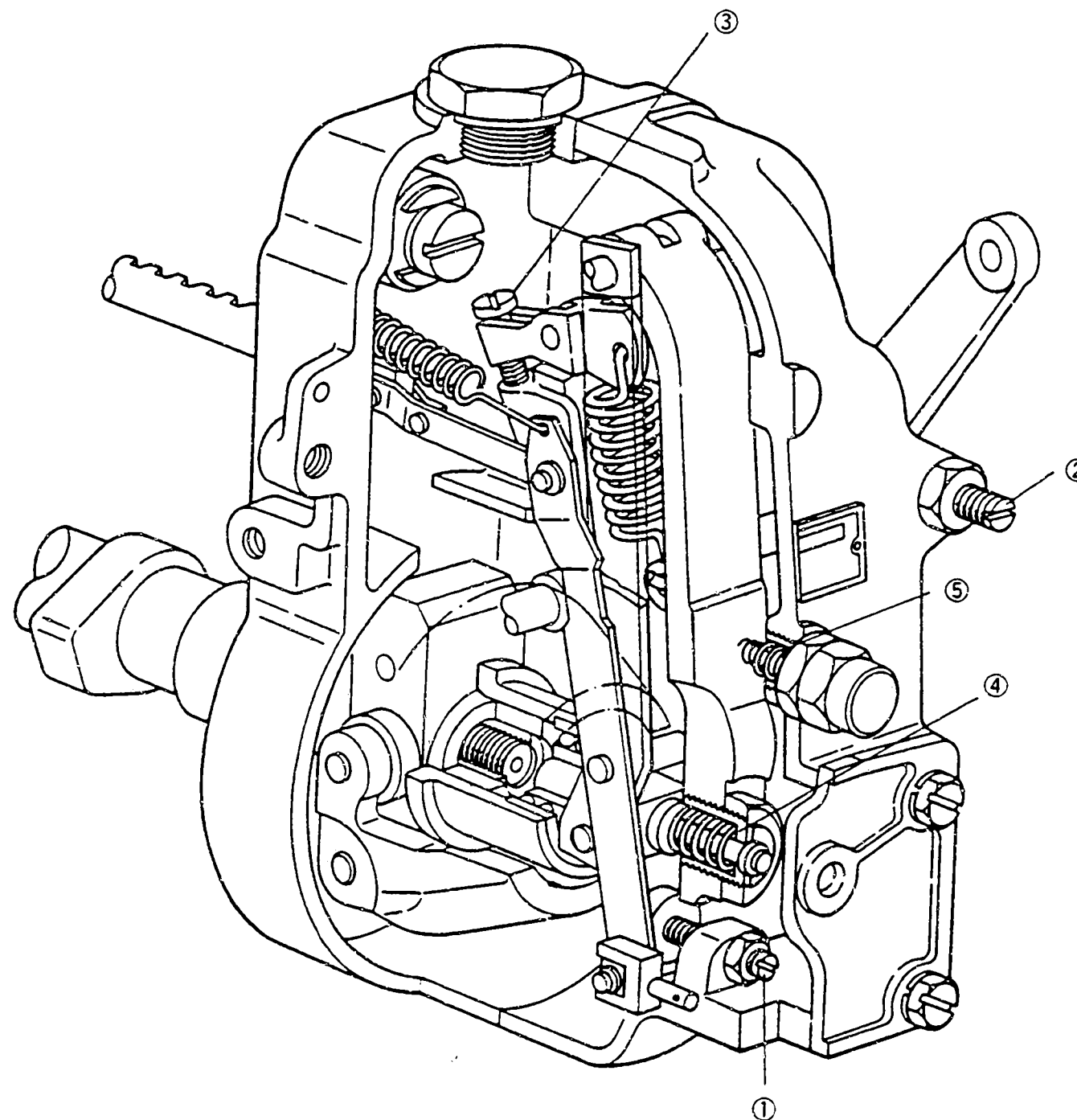


Figure 4  
 1 = Screw  
 2 = Screw  
 3 = Screw  
 4 = Spring capsule  
 5 = Spring capsule

101402-0732 4/4

**A9**

ZEXEL - Test values  
 Injection pumps



**A10**

ZEXEL - Test values  
 Injection pumps



# ZEXEL - TEST VALUES

## Injection pumps

BOSCH No.	:	9 400 610 170	1/4
ZEXEL No.	:	101402-0950	
Date	:	30.05.1992	[1]
Company	:	ISUZU	
Engine	:	4BD1-PTA / 8-94316	
			-946-0
IP-Type number	:	101040-8520 / PES4A	
Governor type number	:	105410-9600 / EP/RSV	

## TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure	bar :	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure	bar :	175
Test pressure line		
Inner x Outer Dia - Length	mm :	2.00 x 6.00 x 600

## PORT CLOSING

Prestroke	mm :	3.4 ± 0.05
Rod position	mm :	-
Port closing mark	Cyl. No. :	-
Cam sequence	:	1 - 3 - 4 - 2
Port closing mark	Cyl. No. :	-
Port closing difference	°NW :	0-90-180-270
Tolerance	+ - °C :	0.50 (0.75)



Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
A	10.4	1100	86.3 - 89.3	± 2	Rack	Basic
H	approx. 6.7	335	6.6 - 9.4	± 14	Rack	
A	10.4	1100	86.3 - 89.3	-	Lever	Basic

Timing Advance Specification :

Speed (rpm)						
Advance Angle (deg.)						

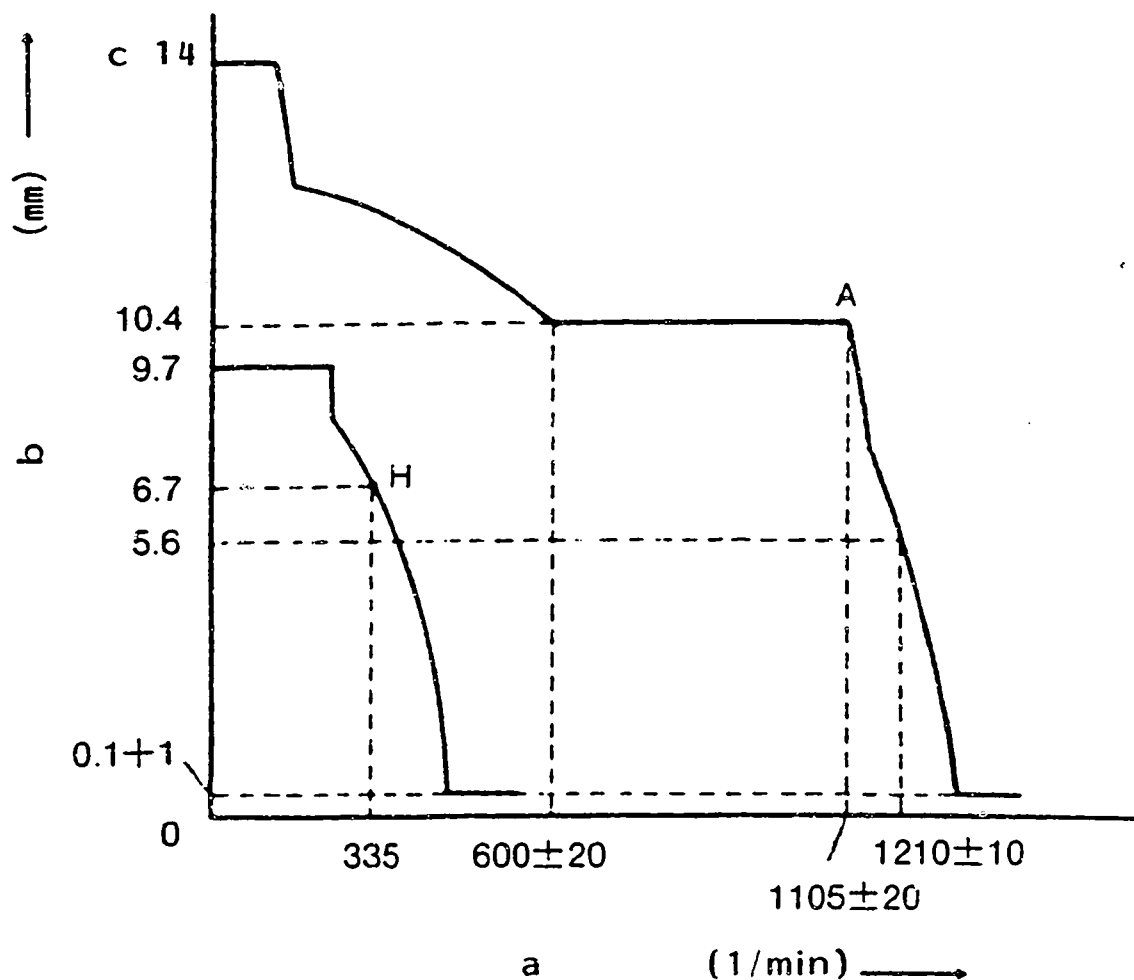


Figure 5

a = Pump speed  
b = Control rack position  
c = Above

#### GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 10

Perform torque control spring adjustment when necessary

**A = Speed control lever angle**

a = Full-speed  
b = Idling

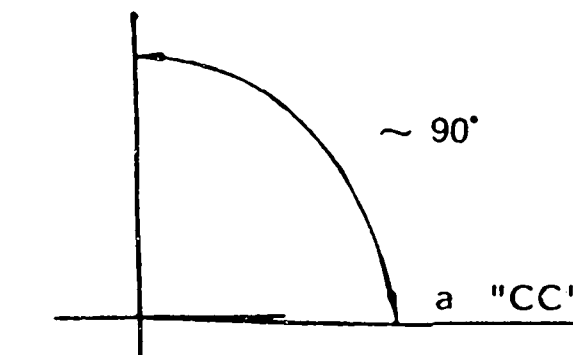
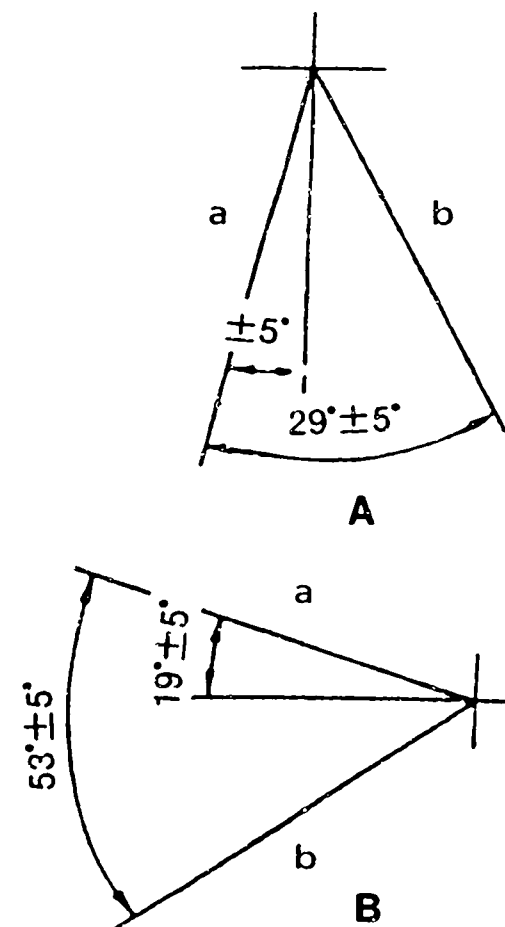


Figure 6

a = Mark

#### TIMING SETTING

At No. 1 plunger's  
beginning of injection  
position (B.T.D.C):  $18^\circ$

101402-0950 2/4

**A14**

ZEXEL - Test values  
Injection pumps



**A15**

ZEXEL - Test values  
Injection pumps



## ■ Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt that the control rack position is 0.5 - 1.0 mm.

## ■ ADJUSTMENT

	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	1105 - 1125	10.4	• Adjust using screw (2)
Torque Control Spring Adjustment			<ul style="list-style-type: none"> <li>• Adjust using spring capsule (4)</li> <li>• Confirm</li> <li>• Confirm</li> <li>• Confirm the torque control stroke is (mm)</li> </ul>
Idling Adjustment	0 335 -	8.8 6.7 -	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Adjust using spring capsule (5)</li> <li>• Confirm</li> </ul>
Maximum-speed Adjustment	1105 - 1125 1200 - 1220	10.4 5.6	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Confirm speed droop</li> <li>• Adjust using screw (3)</li> <li>• Confirm</li> </ul>
Full-load Adjustment	1100	10.4	• Adjust using screw (1)
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>• Measure the control lever angle at the "idling" and "full" positions.</li> <li>• When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Rack Limiter Adjustment	-	-	• Adjust using screw

**A16**
 ZEXEL - Test values  
 Injection pumps
**A17**
 ZEXEL - Test values  
 Injection pumps

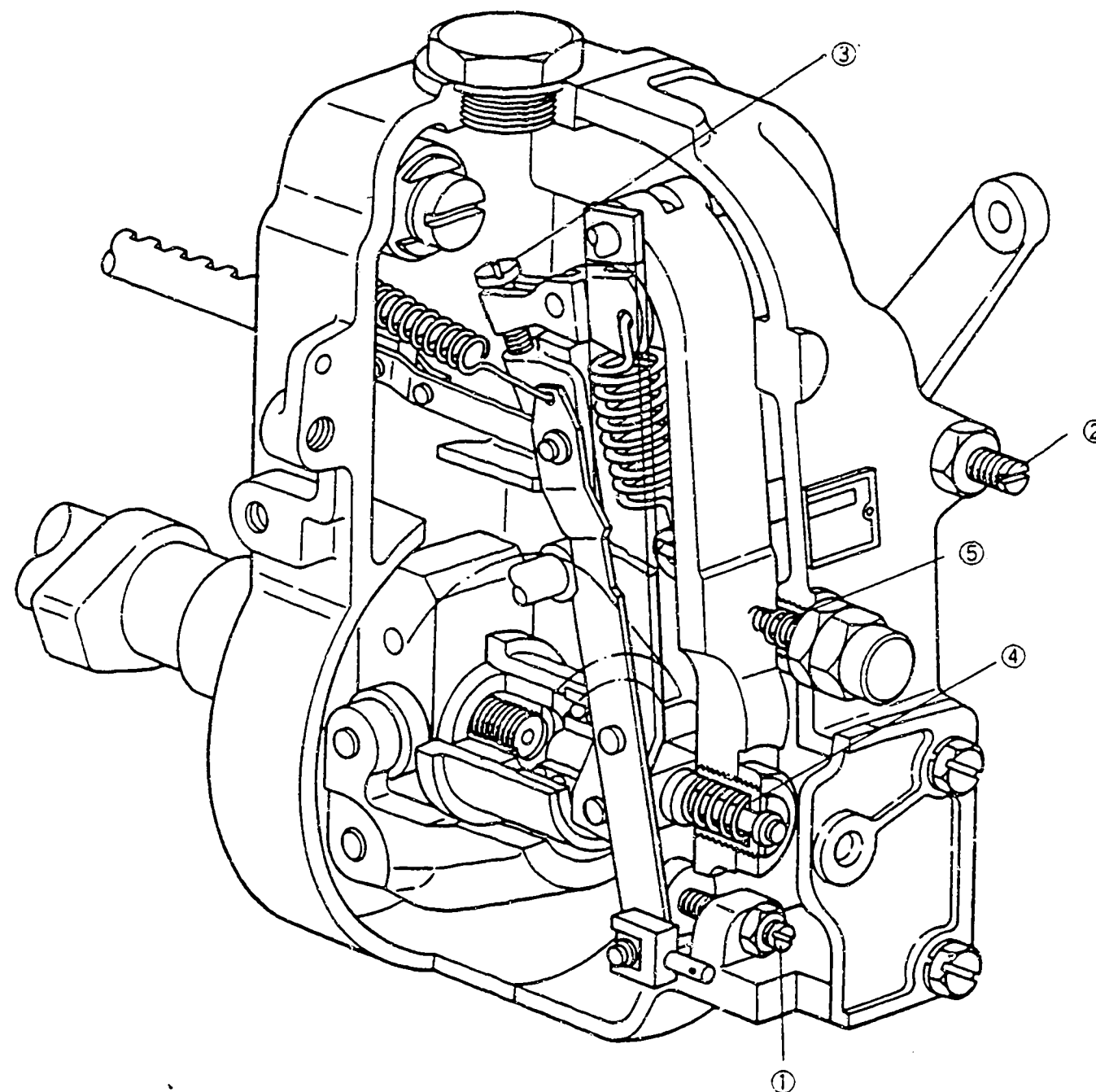



Figure 7  
 1 = Screw  
 2 = Screw  
 3 = Screw  
 4 = Spring capsule  
 5 = Spring capsule

101402-0950 4/4

**A18**

ZEXEL - Test values  
 Injection pumps



**A19**

ZEXEL - Test values  
 Injection pumps



ZEXEL - TEST VALUES  
Injection pumps

BOSCH No.	:	9 400 610 171	1/4
ZEXEL No.	:	101492-0384	
Date	:	30.05.1992	[2]
Company	:	ISUZU	
Engine	:	4JB1 / 8-94342-934-0	

IP-Type number	:	101049-8620 / PES4A
Governor type number	:	105400-5630 / EP/RSV

TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure bar	:	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure bar	:	175
Test pressure line		
Inner x Outer Dia - Length mm	:	2.00 x 6.00 x 600

PORT CLOSING

Prestroke	mm	:	3.3 ± 0.05
Rod position	mm	:	-
Port closing mark Cyl. No.	:	:	-
Cam sequence	:	:	1 - 3 - 4 - 2

Port closing mark Cyl. No.	:	:	-
Port closing difference °NW	:	:	0-90-180-270

Tolerance	+- °C:	0.50 (0.75)
-----------	--------	-------------





Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
A	11.1	1000	49.2 - 51.2	± 2.5	Rack	Basic
H	approx. 8.5	400	6.7 - 10.7	± 15	Rack	
A	11.1	1000	49.2 - 51.2	-	Lever	Basic

Timing Advance Specification :

Speed (rpm)						
Advance Angle (deg.)						

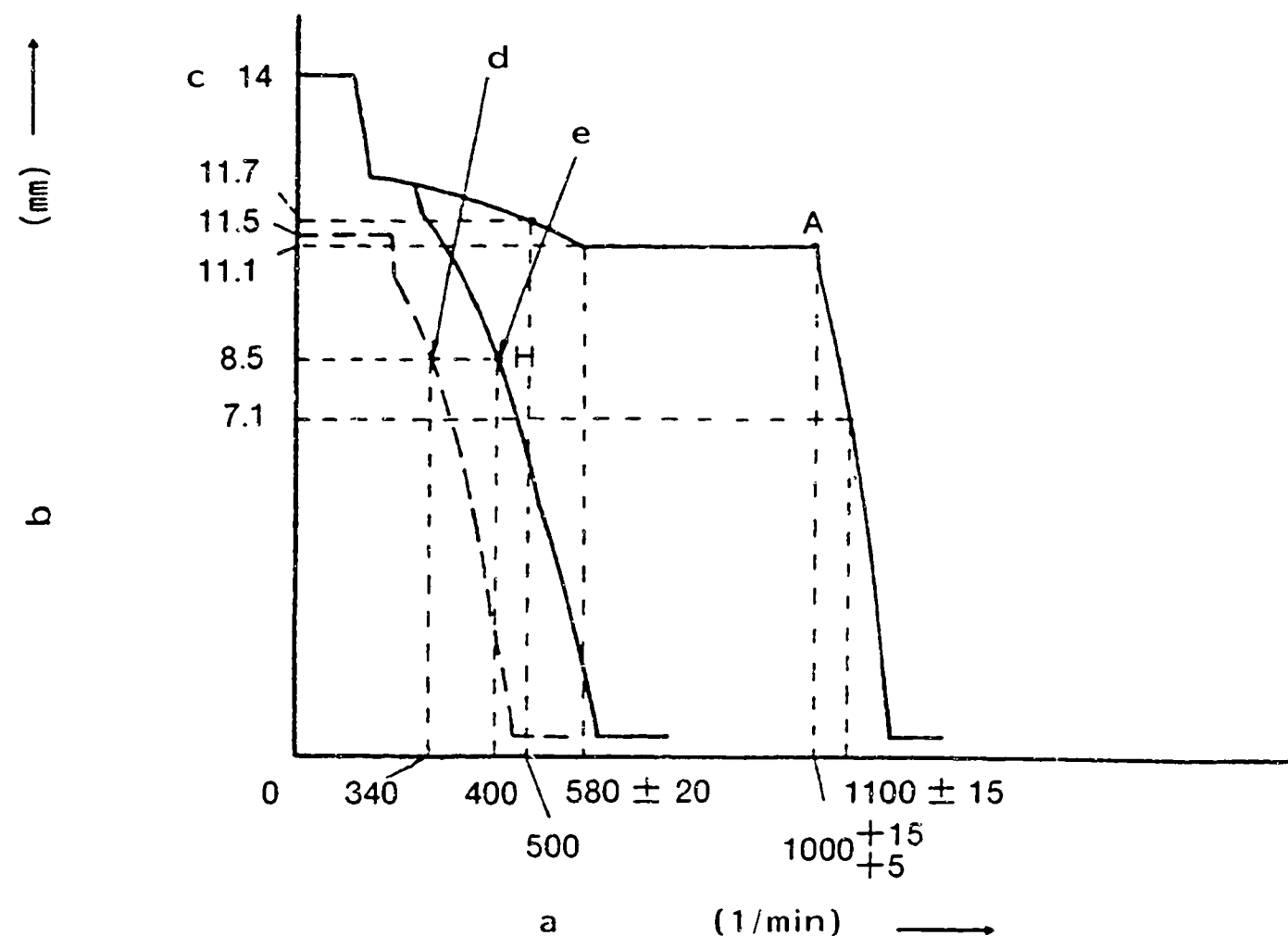


Figure 8

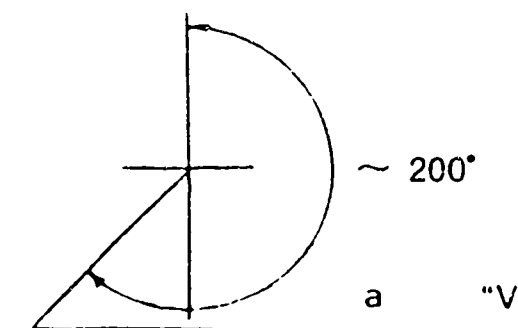
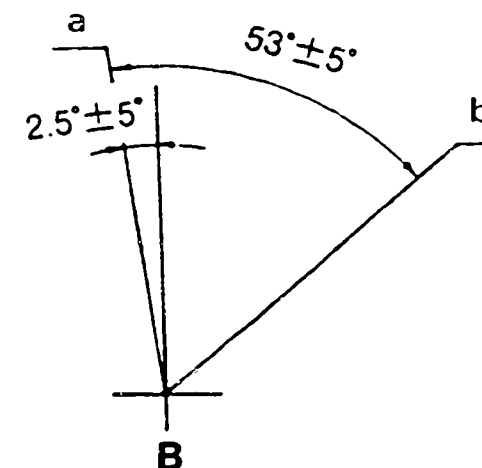
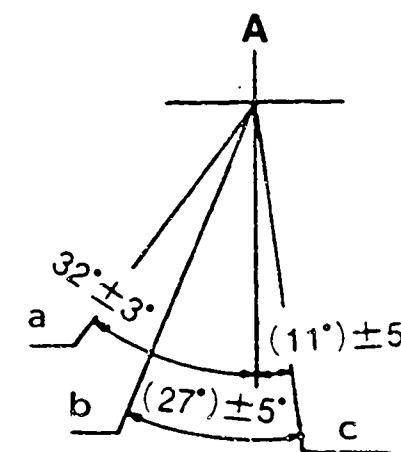
a = Pump speed  
b = Control rack position  
c = Above  
d = Idle-sub spring setting  
e = Governor spring setting

#### GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 17

**A = Speed control lever angle**

a = Stop  
b = Idling  
c = Full-speed



101492-0384 2/4

Figure 9  
a = Mark

#### ■ TIMING SETTING

At No. 1 plunger's  
beginning of injection  
position (B.T.D.C): 17°

**A23**

ZEXEL - Test values

Injection pumps



**A24**

ZEXEL - Test values

Injection pumps



## ■ Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt that the control rack position is 0.5 - 1.0 mm.

## ■ ADJUSTMENT

	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	1005 - 1015 1000	11.1 11.1	<ul style="list-style-type: none"> <li>• Adjust using screw (2)</li> <li>• Adjust using screw (1)</li> </ul>
Idling Adjustment	400 0 340	8.5 11.5 8.5	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Fix the control lever</li> <li>• Adjust using spring capsule (5)</li> </ul>
Maximum-speed Adjustment	1005 - 1015 1085 - 1115  560 - 600  - -	11.1 7.1  11.1  - -	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Confirm speed droop, adjust using screw (3)</li> <li>• Adjust using spring capsule (4)</li> <li>• Confirm</li> <li>• Confirm</li> </ul>
Full-load Adjustment (install the cover on governor cover)	1000	11.1	<ul style="list-style-type: none"> <li>• Adjust using screw (2)</li> </ul>
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>• Measure the control lever angle at the "idling" and "full" positions.</li> <li>• When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Rack Limiter Adjustment	-	-	<ul style="list-style-type: none"> <li>• Adjust using screw</li> </ul>

**A25**

ZEXEL - Test values  
Injection pumps

**A26**

ZEXEL - Test values  
Injection pumps



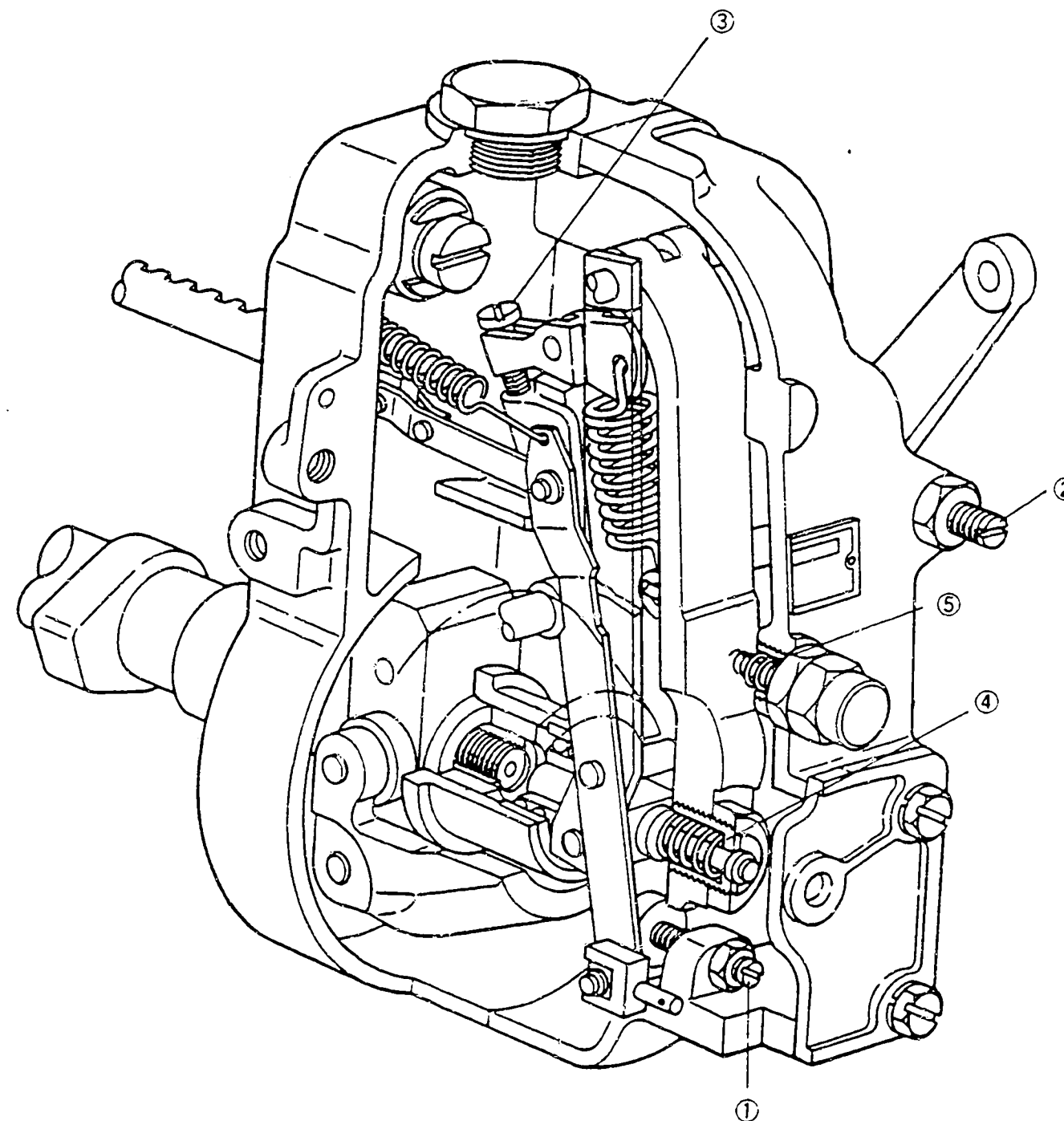


Figure 10  
 1 = Screw  
 2 = Screw  
 3 = Screw  
 4 = Spring capsule  
 5 = Spring capsule

101492-0384 4/4



ZEXEL - TEST VALUES  
Injection pumps

BOSCH No.	:	9 400 610 157	1/4
ZEXEL No.	:	101602-0840	
Date	:	30.05.1992	[0]
Company	:	ISUZU	
Engine	:	6BB1 / 11560 11510	

IP-Type number	:	101060-8560 / PES6A
Governor type number	:	105410-6030 / EP/RSV

TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure bar	:	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure bar	:	175
Test pressure line	:	
Inner x Outer Dia - Length mm	:	2.00 x 6.00 x 600

PORT CLOSING

Prestroke	mm	:	3.6 ± 0.05
Rod position	mm	:	-
Port closing mark Cyl. No.	:	:	-
Cam sequence	:	:	1-5-3-6-2-4
Port closing mark Cyl. No.	:	:	-
Port closing difference °NW	:	:	0-60-120-180-240-300
Tolerance	+ - °C	:	0.50 (0.75)



Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Method	Remarks
	8.8	700	53.0 - 55.0	± 2	Rack	Basic
H	approx. 6.7	385	8.1 - 10.7	± 14	Rack	
A	8.8	700	53.0 - 55.0	-	Lever	

Timing Advance Specification :

Speed (rpm)						
Advance Angle (deg.)						

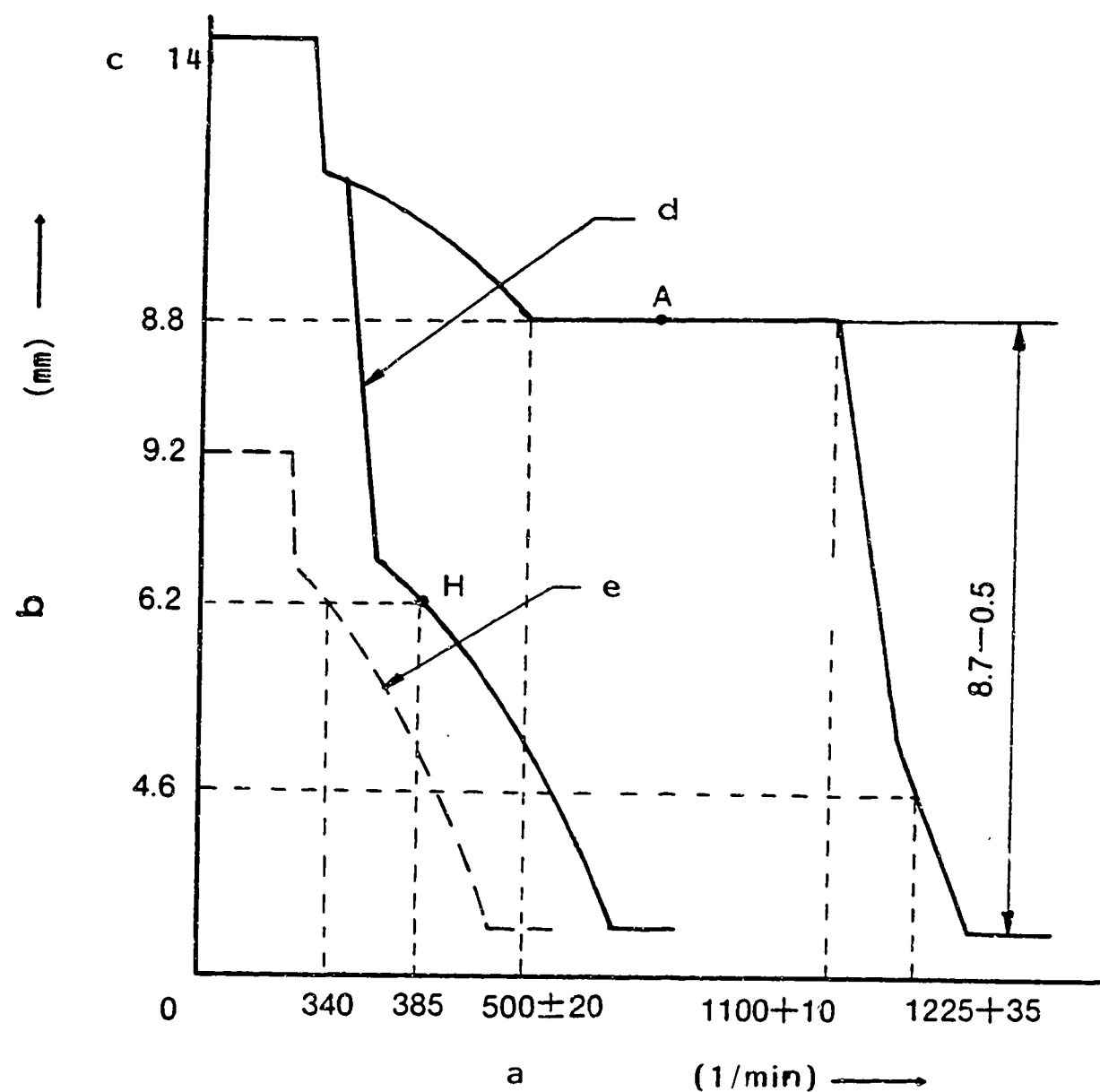


Figure 11

a = Pump speed  
b = Control rack position  
c = Above  
d = Governor spring setting  
e = Idle sub spring setting

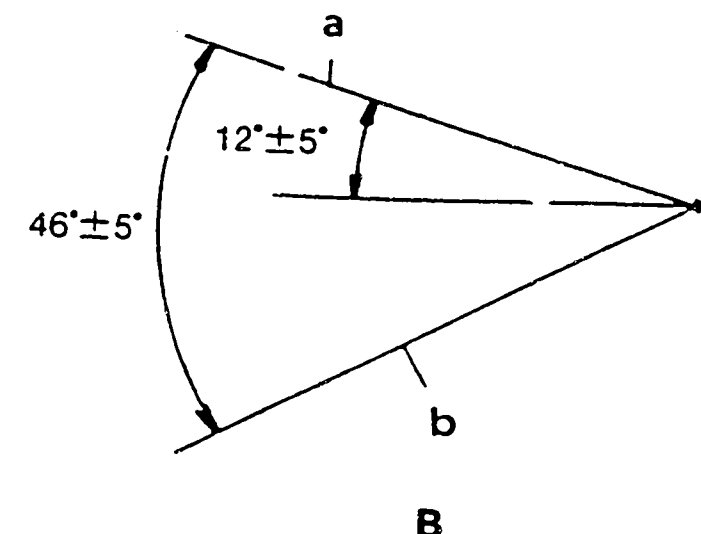
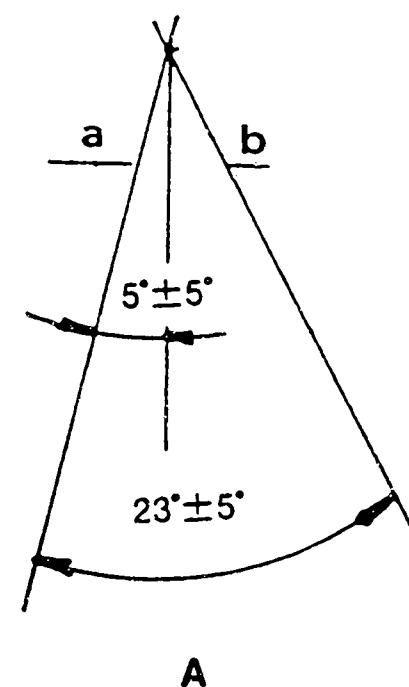
# GOVERNOR ADJUSTMENT

A = Speed control lever angle

a = Full-speed  
b = Idling

B = Stop lever angle

a = Normal  
b = Stop



## ■ Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt that the control rack position is 0.5 - 1.0 mm.

## ■ ADJUSTMENT

	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	1100 - 1110 1100	8.8 8.8	<ul style="list-style-type: none"> <li>• Adjust using screw (2)</li> <li>• Adjust using screw (1)</li> </ul>
Torque Control Spring Adjustment			<ul style="list-style-type: none"> <li>• Adjust using spring capsule (4)</li> </ul>
Idling Adjustment	385 0  340  -	approx. 6.2 above 14  approx. 6.2  -	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Freely position the control lever</li> <li>• Adjust using spring capsule (5)</li> <li>• Confirm</li> </ul>
Maximum-speed Adjustment	1100 - 1110 1225 - 1260  1300	8.8 4.6  0.1 - 0.6	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Adjust speed droop, using screw (3)</li> <li>• Confirm</li> </ul>
Full-load Adjustment (install the cover on governor cover)	1100	8.8	<ul style="list-style-type: none"> <li>• Adjust using screw (1)</li> </ul>
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>• Measure the control lever angle at the "idling" and "full" positions.</li> <li>• When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Rack Limiter Adjustment	-	-	<ul style="list-style-type: none"> <li>• Adjust using screw</li> </ul>

**B6**

ZEXEL - Test values

---

Injection pumps

**B7**

ZEXEL - Test values

---

Injection pumps





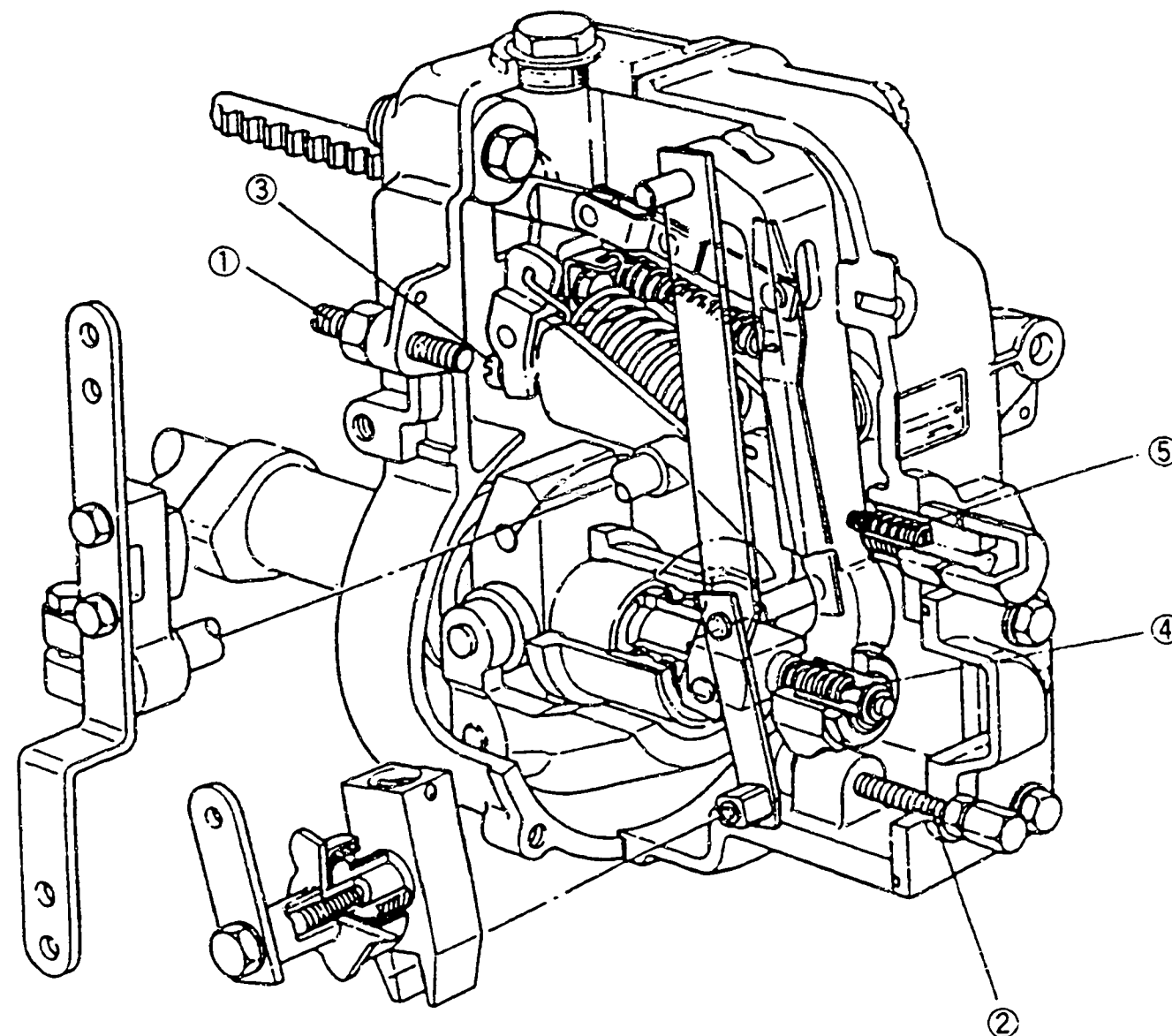


Figure 12  
 1 = Screw  
 2 = Screw  
 3 = Screw  
 4 = Spring capsule  
 5 = Spring capsule

101602-0840 4/4

**B8**

ZEXEL - Test values  
 Injection pumps



**B9**

ZEXEL - Test values  
 Injection pumps



# ZEXEL - TEST VALUES

## Injection pumps

BOSCH No.	:	9 400 610 173	1/4
ZEXEL No.	:	101602-7040	
Date	:	30.05.1992	[1]
Company	:	ISUZU	
Engine	:	6BD1T /1-15602-377-0	

IP-Type number	:	101060-4200 / PE6A
Governor type number	:	105410-8331 / EP/RSV

## TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure	bar :	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure	bar :	175
Test pressure line		
Inner x Outer Dia - Length	mm :	2.00 x 6.00 x 600

## PORT CLOSING

Prestroke	mm :	3.4 ± 0.05
Rod position	mm :	-
Port closing mark	Cyl. No. :	-
Cam sequence	:	1-5-3-6-2-4
Port closing mark	Cyl. No. :	-
Port closing difference	°NW :	60-120-180-240-300
Tolerance	+ - °C :	± 0.50 (0.75)



Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
A	8.4	1000	74.0 - 77.0	± 2	Rack	Basic
H	(5.6)	370	8.1 - 10.7	± 14	Rack	
A	8.4	1000	74.0 - 77.0	-	Lever	Basic

Timing Advance Specification :

Speed (rpm)						
Advance Angle (deg.)						

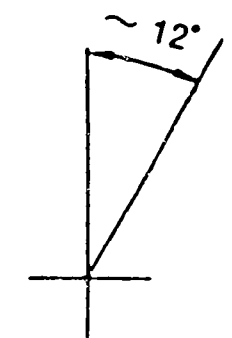
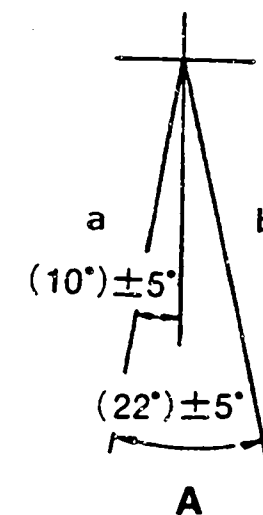
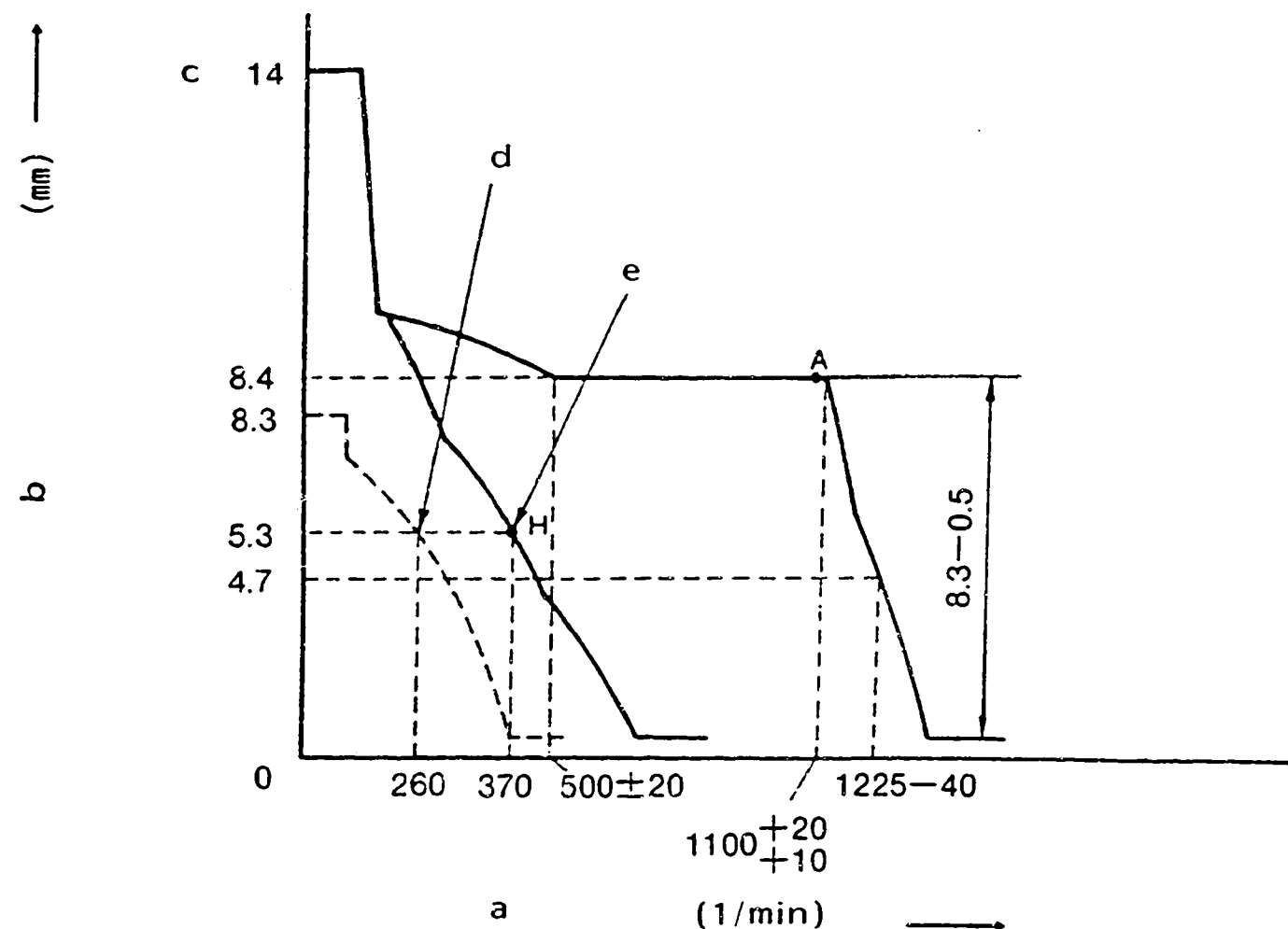


Figure 13

# GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 15

101602-7040 2/4

a = Pump speed  
b = Control rack position  
c = Above  
d = Idle-sub spring setting  
e = Governor spring setting

**A = Speed control lever angle**

a = Full-speed  
b = Idling

## TIMING SETTING

At No. 1 plunger's beginning of injection position.

a = Centre of flywheel's threaded hole

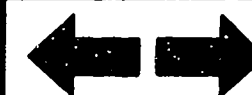
**B13**

ZEXEL - Test values  
Injection pumps



**B14**

ZEXEL - Test values  
Injection pumps



## ■ Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt that the control rack position is 0.5 - 1.0 mm.

## ■ ADJUSTMENT

	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	1110 - 1120 1000	8.4 8.4	<ul style="list-style-type: none"> <li>• Adjust using screw (2)</li> <li>• Adjust using screw (1)</li> </ul>
Idling Adjustment	370 0 260	5.3 8.3 5.3	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Fix the control lever</li> <li>• Adjust using spring capsule (5)</li> </ul>
Maximum-speed Adjustment	1110 - 1120 1185 - 1225 480 - 520 - -	8.4 4.7 8.4 - -	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Confirm speed droop, adjust using screw (3)</li> <li>• Adjust using spring capsule (4)</li> <li>• Confirm</li> <li>• Confirm</li> </ul>
Full-load Adjustment (install the cover on governor cover)	1000	8.4	<ul style="list-style-type: none"> <li>• Adjust using screw (1)</li> </ul>
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>• Measure the control lever angle at the "idling" and "full" positions.</li> <li>• When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Rack Limiter Adjustment	-	-	<ul style="list-style-type: none"> <li>• Adjust using screw</li> </ul>



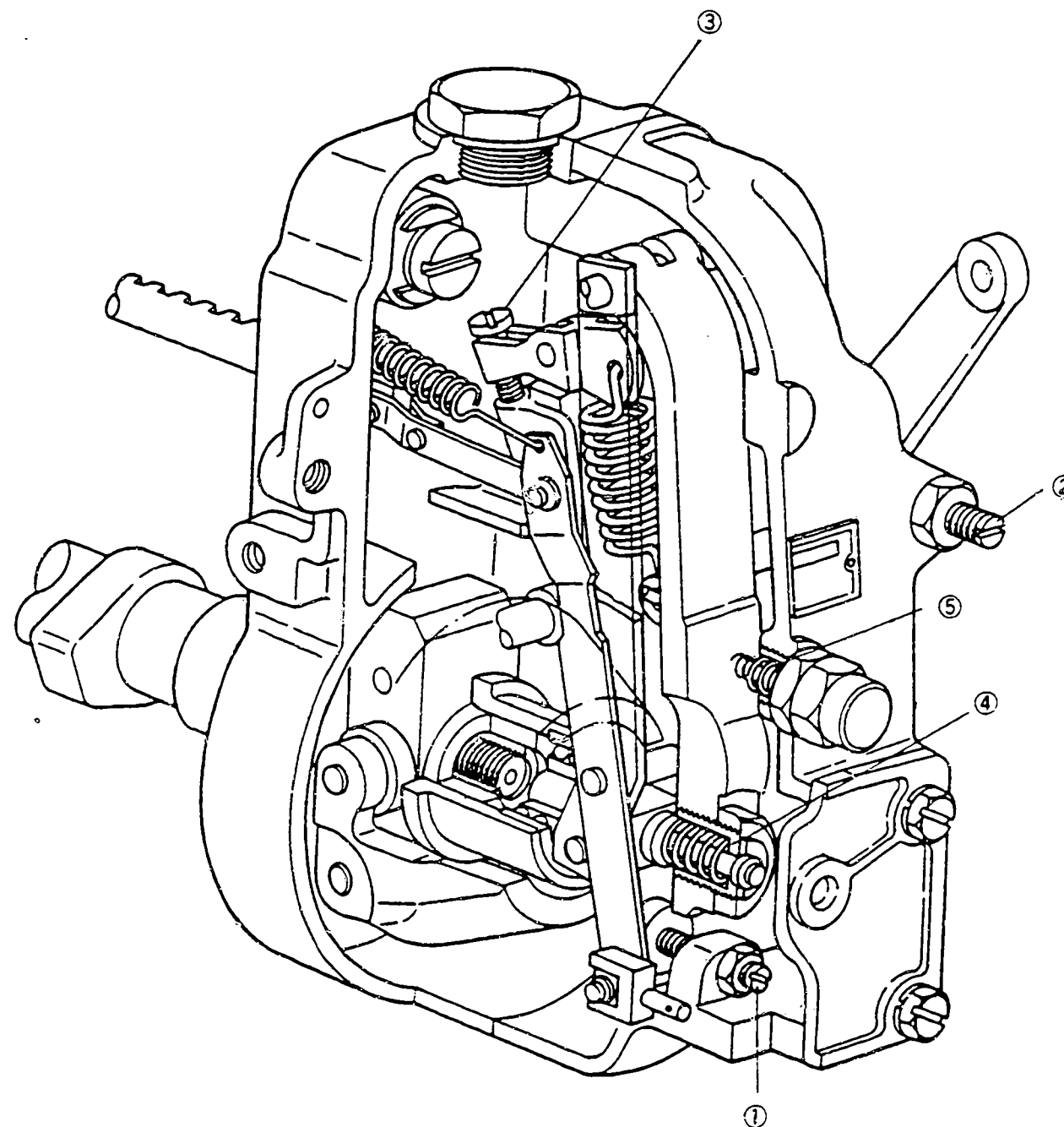


Figure 14

- 1 = Screw
- 2 = Screw
- 3 = Screw
- 4 = Spring capsule
- 5 = Spring capsule

101602-7040 4/4

**B17**

ZEXEL - Test values  
Injection pumps



**B18**

ZEXEL - Test values  
Injection pumps



# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 166	1/4
ZEXEL No.	:	101602-9490	
Date	:	30.05.1992	[1]
Company	:	DAEWOO HEAVY	
Engine	:	6BB1	

IP-Type number : 101060-8790 / PES6A  
Governor type number : 105412-1970 / EP/RSV

## TEST PREREQUISITES

Test oil : ISO-4113  
Test oil inlet temperature °C : 40.00...45.00  
Inlet pressure bar : 1.6  
Test nozzle holder combination : 1 688 901 013  
Opening pressure bar : 175  
Test pressure line  
Inner x Outer Dia - Length mm : 2.00 x 6.00 x 600

## PORT CLOSING

Prestroke mm : 3.6 ± 0.05  
Rod position mm : -  
Port closing mark Cyl. No. : -  
Cam sequence : 1-5-3-6-2-4  
  
Port closing mark Cyl. No. : -  
Port closing difference °NW : 0-60-120-180-240-300  
  
Tolerance +- °C: 0.50 (0.75)



Continued (Test values)

Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
A	9.1	700	56.1 - 59.1	± 2.5	Rack	Basic
C	approx. 6.7	350	8.1 - 10.7	± 14	Rack	
A	9.1	700	56.1 - 59.1	-	Lever	Basic
B	8.8	1050	57.4 - 61.0	± 4.0	Lever	

Timing Advance Specification :

Speed (rpm)						
Advance Angle (deg.)						

**B 20**

ZEXEL - Test values  
Injection pumps



**B 21**

ZEXEL - Test values  
Injection pumps





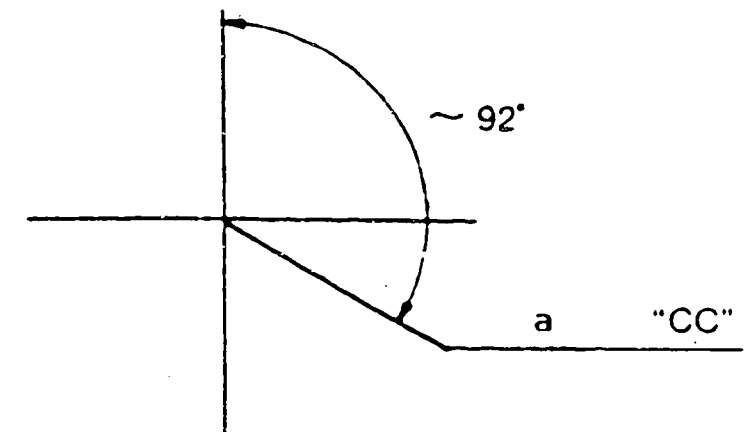
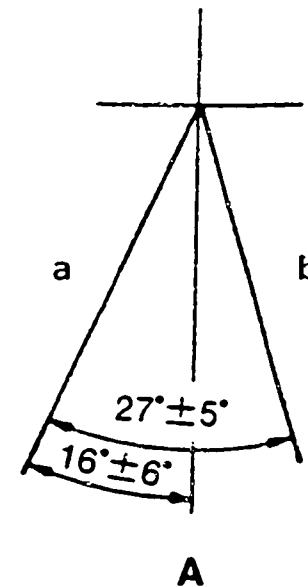
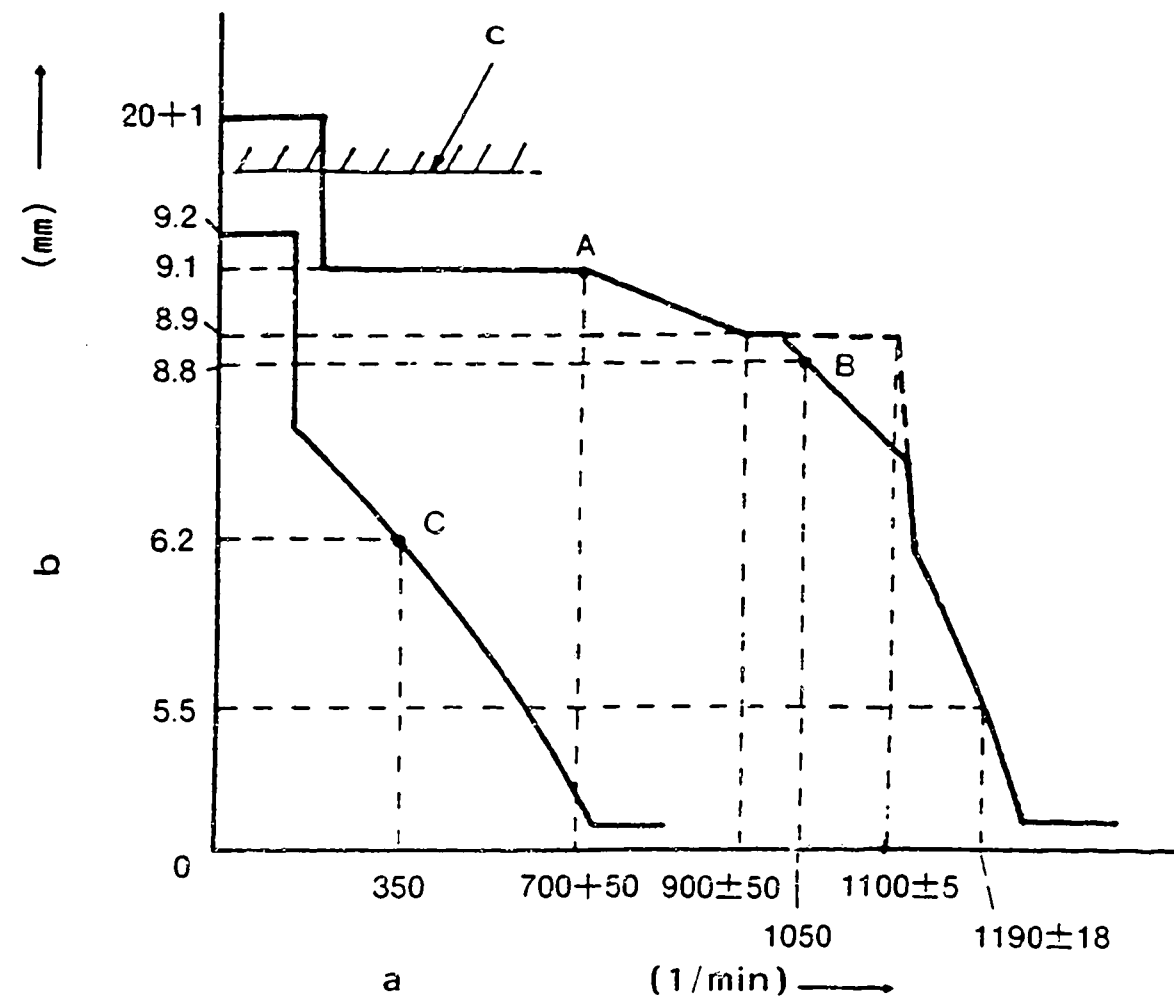


Figure 15

# GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 15

101602-9490 2/4

a = Pump speed  
b = Control rack position  
c = Control rack cap:  
about 17.5

A = Control lever angle

a = Full-speed  
b = Idling

## TIMING SETTING

At No. 1 plunger's beginning of  
injection position. B.T.D.C: 20°

a = Mark

B22

ZEXEL - Test values  
Injection pumps



B23

ZEXEL - Test values  
Injection pumps



	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	1100 900	8.9 8.9	<ul style="list-style-type: none"> <li>• Adjust using screw (2)</li> <li>• Adjust using screw (1)</li> </ul>
Torque Control Spring Adjustment	700 - 750 850 - 950	9.1 8.9	<ul style="list-style-type: none"> <li>• Adjust using spring capsule (4)</li> <li>• Confirm</li> <li>• Confirm</li> <li>• Confirm the torque control stroke 0.2 mm</li> </ul>
Idling Adjustment	0 350 -	9.2 6.2 -	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Adjust using spring capsule (5)</li> <li>• Confirm</li> </ul>
Maximum-speed Adjustment	1095 - 1105 1172 - 1208	8.9 5.5	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Adjust using screw (3)</li> <li>• Confirm</li> <li>• Confirm</li> </ul>
Full-load Adjustment (install the cover on governor cover)	900	8.9	<ul style="list-style-type: none"> <li>• Adjust using screw (1)</li> </ul>
Torque Control Spring Adjustment	1050	8.8	<ul style="list-style-type: none"> <li>• Adjust using spring capsule (6)</li> </ul>
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>• Measure the control lever angle at the "idling" and "full" positions.</li> <li>• When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Rack Limiter Adjustment	-	about 17.5	<ul style="list-style-type: none"> <li>• Adjust using screw</li> </ul>



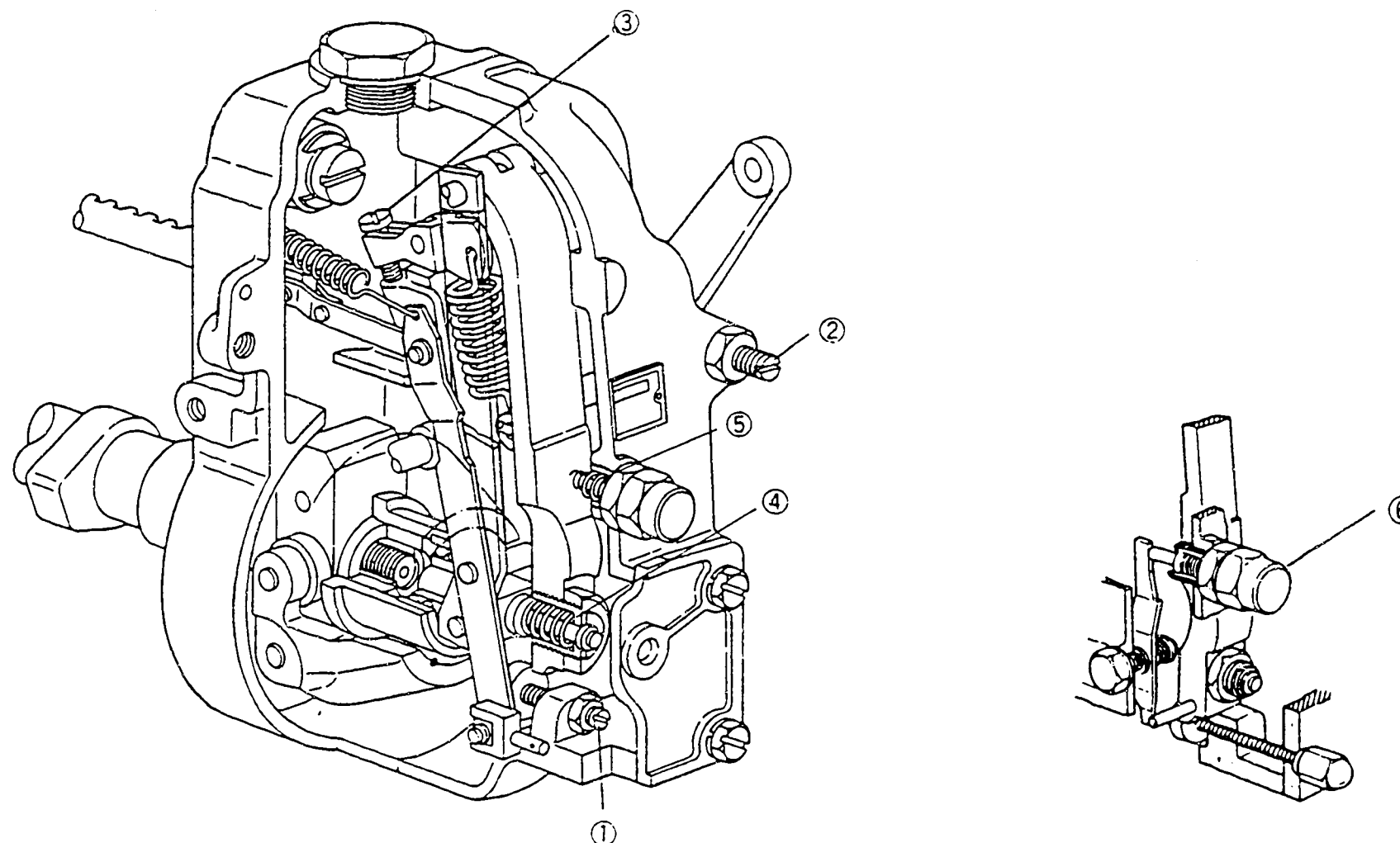


Figure 16

- 1 = Screw
- 2 = Screw
- 3 = Screw
- 4 = Spring capsule
- 5 = Spring capsule
- 6 = Spring capsule

101602-9490 4/4

■ Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt that the control rack position is 0.5 - 1.0 mm.

**B26**

ZEXEL - Test values  
Injection pumps



**B27**

ZEXEL - Test values  
Injection pumps



# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 156	1/4
ZEXEL No.	:	101602-9501	
Date	:	30.05.1992	[2]
Company	:	NISSAN DIESEL	
Engine	:	FD6 / 16713 L9205	
IP-Type number	:	101060-9631 / PES6A	
Governor type number	:	105921-0920 / EP/RLD	

## TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure	bar :	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure	bar :	175
Test pressure line		
Inner x Outer Dia - Length	mm :	2.00 x 6.00 x 600

## PORT CLOSING

Prestroke	mm :	3.0 ± 0.05
Rod position	mm :	-
Port closing mark	Cyl. No. :	-
Cam sequence	:	1-4-2-6-3-5
Port closing mark	Cyl. No. :	-
Port closing difference	°NW :	0-60-120-180-240-300
Tolerance	+ - °C:	0.50 (0.75)



Continued (Test values)

Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
	10.1	1000	47.1 - 50.3	± 3.5	Rack	Basic
H	approx. 9.8	335	6.2 - 9.8	± 10	Rack	
A	R <sub>1</sub> (10.1)	1000	47.7 - 49.7	-	Lever	Basic
I	approx. 12.0	100	62.0 - 72.0	-	Lever	(Control rack limit)

Timing Advance Specification:

Speed (rpm)						
Advance Angle (deg)						

**C2**

ZEXEL - Test values  
Injection pumps



**C3**

ZEXEL - Test values  
Injection pumps



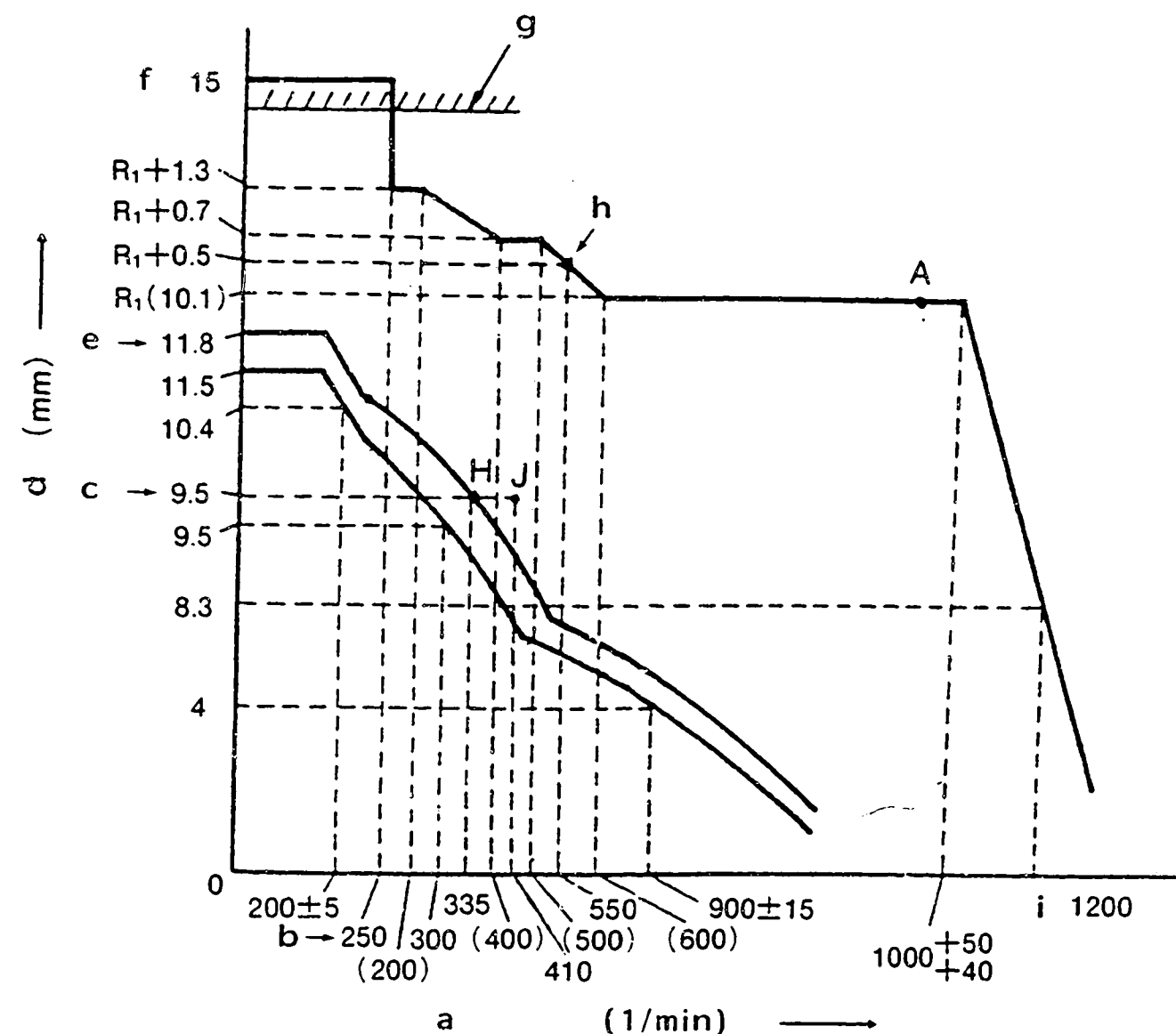


Figure 17

a = Pump speed  
b = below  
c = about  
d = Control rack position  
e = above  
f = above  
g = Control rack limit:  
about 12  
h = Basic torque cam adjustment  
i = below

#### GOVERNOR ADJUSTMENT

A = Control lever angle

a = Idling  
b = Full-speed

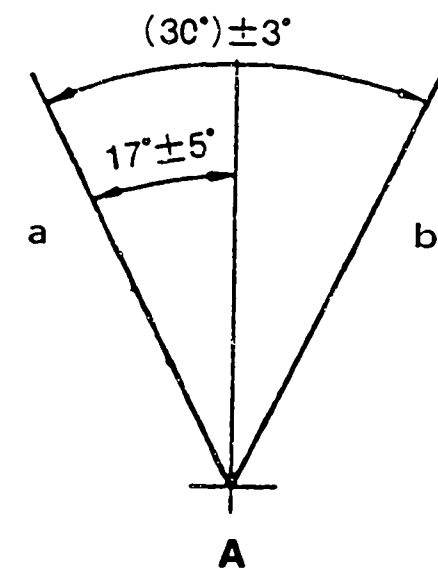


Figure 18

101602-9501 2/4

a = Mark

■ TIMING SETTING

At No. 1 plunger's beginning of  
injection position.  
B.T.D.C: 18.5°

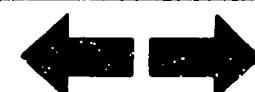
C4

ZEXEL - Test values  
Injection pumps



C5

ZEXEL - Test values  
Injection pumps



	Pump Speed (rpm)	Rack position (mm)	Remarks
Full Speed Lever Position temporary setting	1000	R <sub>1</sub> (10.1)	• Adjust using screw (3)
Full Load Position Adjustment	1000	R <sub>1</sub> (10.1)	• Adjust using screw (7)
Torque Cam Position Adjustment	550 (500) (400) (200) (600)	R <sub>1</sub> +0.5 R <sub>1</sub> +0.7 R <sub>1</sub> +0.7 R <sub>1</sub> +1.3 R <sub>1</sub> (10.1)	• Adjust using screw (5)  • Confirm • Confirm • Confirm • Confirm
Confirm injection quantity at point A			
Maximum Speed Control Adjustment	below 1200 -	8.3 -	• Adjust using screw (3) • After adjustment confirm that the control lever angle is (27° - 33°)
Confirming Excess Fuel Limit for Engine Starting	410 0	approx. 9.5 12.5	• Set the control lever at point J • Confirm • Move the control lever to the "full speed" position and then confirm the control rack position
Confirm the Black Smoke Limit	Fix the control lever at point H. Then operate the pump at 250 rpm. Confirm that the control rack does not move beyond R <sub>1</sub> +1.3 mm. When the control lever is moved to the "full speed" position, again increase the pump speed and confirm that the control rack starts to move from a pump speed of 335 rpm.		
Rack Limiter Adjustment	100	62.0 - 72.0 (cc/100 st)	• Fix the control rack using screw
	Measure the depth of the control rack cap. Then adjust screw (6) so that it equals the depth of the rack cap and install the rack cap. Confirm injection quantity.		



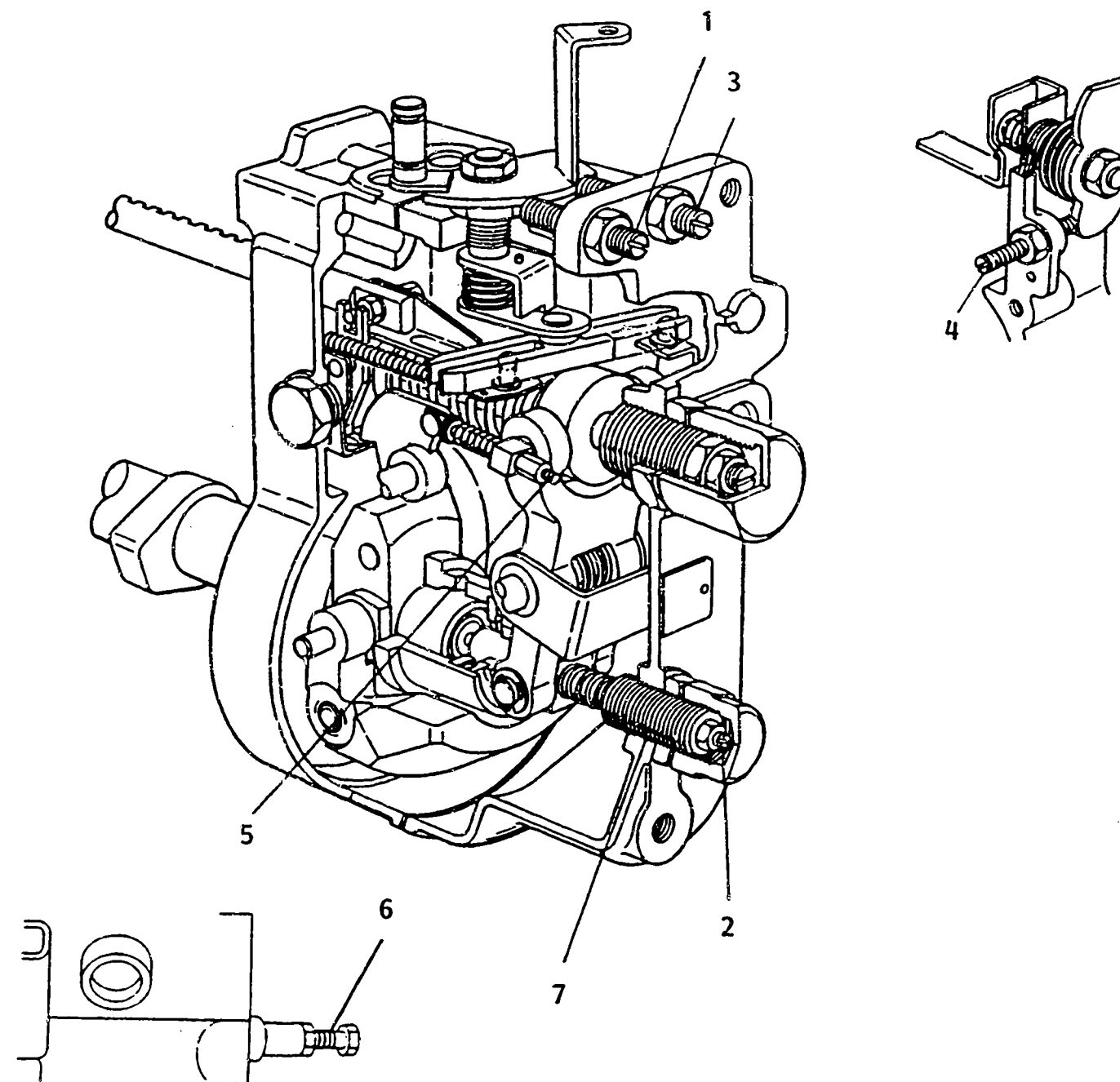


Figure 19

101602-9501 4/4

- 1 = Screw
- 2 = Screw
- 3 = Screw
- 4 = Spring capsule

- 5 = Screw
- 6 = Screw
- 7 = Screw

**C8**

ZEXEL - Test values  
Injection pumps



**C9**

ZEXEL - Test values  
Injection pumps





	Pump speed (rpm)	Rack position (mm)	Remarks
Idling Lever Position temporary setting	80 - 100	11.5	• Adjust using screw (1)
Idling Adjustment	195- 205	10.4	• Adjust using spring capsule (4)
	300	9.5	• Adjust using screw (2)
Governor Spring Contact Adjustment	885 - 915	4.0	• Adjust the governor shaft position
Setting the Idling Lever Position	335 -	approx. 9.5	• Adjust using screw (1) • Confirm the control lever angle is (12° - 22°)

**C10**

ZEXEL - Test values

---

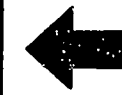
Injection pumps

**C11**

ZEXEL - Test values

---

Injection pumps



# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 164	1/4
ZEXEL No.	:	101682-9390	
Date	:	30.05.1992	[0]
Company	:	DAEWOO HEAVY	
Engine	:	D0846HM	

IP-Type number	:	101068-9000 / PES6A
Governor type number	:	105412-2060 / EP/RSV

## TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure bar	:	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure bar	:	175
Test pressure line		
Inner x Outer Dia - Length mm	:	2.00 x 6.00 x 600

## PORT CLOSING

Prestroke	mm	:	1.5 ± 0.05
Rod position	mm	:	-
Port closing mark Cyl. No.	:	:	-
Cam sequence	:	:	1-5-3-6-2-4
Port closing mark Cyl. No.	:	:	-
Port closing difference °NW	:	:	0-60-120-180-240-300
Tolerance	+- °C	:	0.50 (0.75)



Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
A	R <sub>1</sub> (10.5)	800	71.0 - 74.0	± 2.5	Rack	Basic
H	approx. 6.6	350	13.5 - 19.5	± 15	Rack	
A	R <sub>1</sub> (10.5)	800	71.0 - 74.0	-	Lever	Basic
B	R <sub>2</sub> (10.0)	975	66.5 - 70.5	-	Lever	

Timing Advance Specification :

Speed (rpm)						
Advance Angle (deg.)						

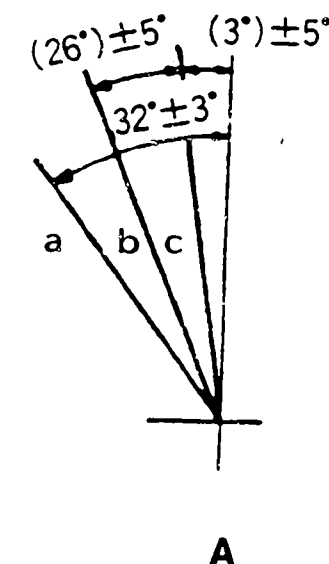
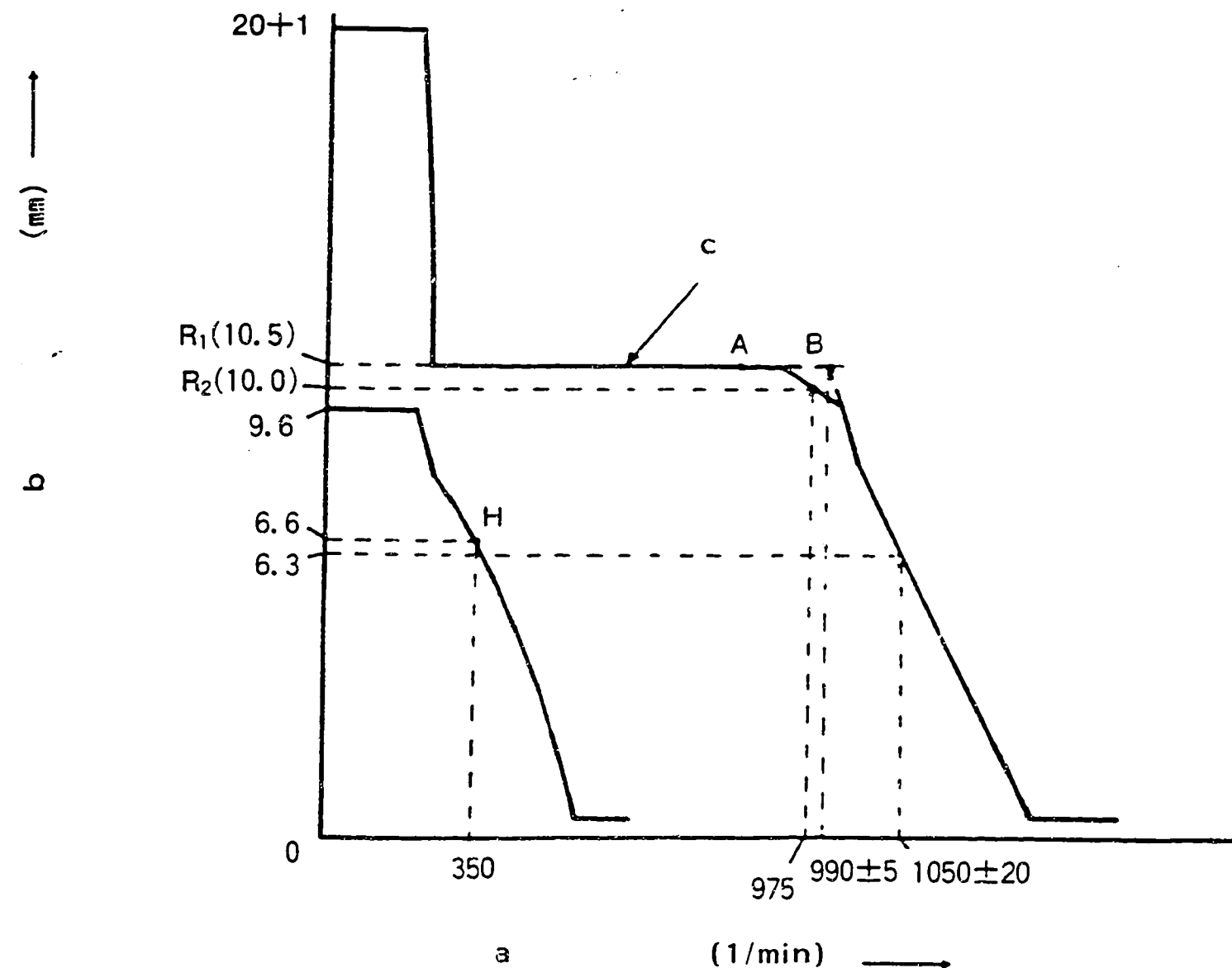


Figure 20

# GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 7

101682-9390 2/4

a = Pump speed  
b = Control rack position  
c = Perform torque control spring adjustment when necessary

A = Control lever angle

a = Stop  
b = Idling  
c = Full-speed

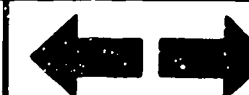
C15

ZEXEL - Test values  
Injection pumps



C16

ZEXEL - Test values  
Injection pumps



	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	985 - 995 800	R <sub>1</sub> (10.5) R <sub>1</sub> (10.5)	<ul style="list-style-type: none"> <li>Adjust using screw (2)</li> <li>Adjust using screw (1)</li> </ul>
Torque Control Spring Adjustment			<ul style="list-style-type: none"> <li>Adjust using spring caps.</li> <li>Confirm</li> <li>Confirm</li> <li>Confirm the torque control stroke mm</li> </ul>
Idling Adjustment	0 350 -	9.6 6.6 -	<ul style="list-style-type: none"> <li>Fix the control lever</li> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> </ul>
Maximum-speed Adjustment	985 - 995 1030 - 1070	R <sub>1</sub> (10.5) 6.3	<ul style="list-style-type: none"> <li>Fix the control lever</li> <li>Adjust using screw (3)</li> <li>Confirm</li> <li>Confirm</li> </ul>
Torque Control Spring Adjustment	975	R <sub>2</sub> (10.0)	<ul style="list-style-type: none"> <li>Adjust using spring capsule (6)</li> </ul>
Full-load Adjustment (install the cover on governor cover)	800	R <sub>1</sub> (10.5)	<ul style="list-style-type: none"> <li>Confirm</li> </ul>
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>Measure the control lever angle at the "idling" and "full" positions.</li> <li>When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Rack Limiter Adjustment	-	-	<ul style="list-style-type: none"> <li>Adjust using screw</li> </ul>



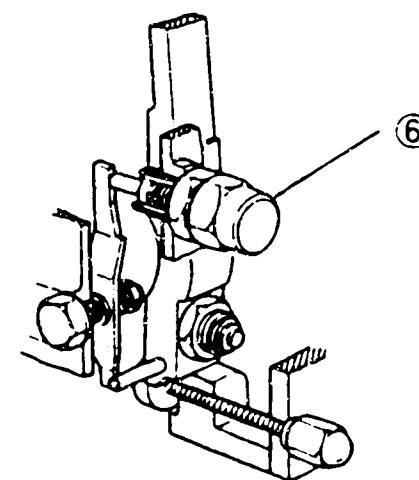
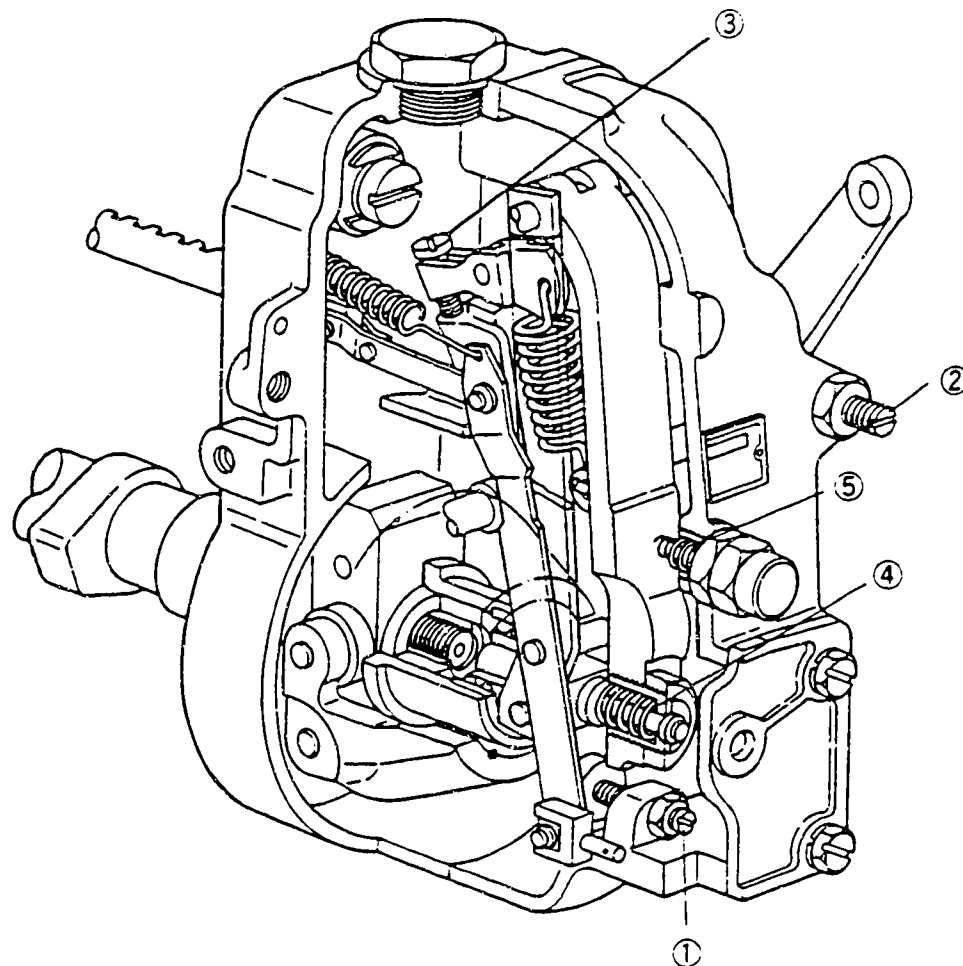


Figure 21

- 1 = Screw
- 2 = Screw
- 3 = Screw
- 4 = Spring capsule
- 5 = Spring capsule
- 6 = Spring capsule

101682-9390 4/4

**Note**

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt that the control rack position is 0.5 - 1.0 mm.

**C19**

ZEXEL - Test values  
Injection pumps



**C20**

ZEXEL - Test values  
Injection pumps



ZEXEL - TEST VALUES  
Injection pumps

BOSCH No.	:	9 400 610 161	1/4
ZEXEL No.	:	101803-1740	
Date	:	30.05.1992	[1]
Company	:	MITSUBISHI	
Engine	:	8DC9 / ME060567	

IP-Type number	:	101080-0860 / PE8AD
Governor type number	:	105412-1990 / EP/RSV

TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure bar	:	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure bar	:	175
Test pressure line		
Inner x Outer Dia - Length mm	:	2.00 x 6.00 x 600

PORT CLOSING

Prestroke	mm	:	4.5 ± 0.05
Rod position	mm	:	-
Port closing mark Cyl. No.	:		-
Cam sequence	:		1-2-7-3-4-5-6-8
Port closing mark Cyl. No.	:		-
Port closing difference °NW	:		0-45-90-135-180-225 -270-315
Tolerance	+ - °C	:	0.50 (0.75)

**D1**

ZEXEL - Test values  
Injection pumps



## Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
A	8.0	900	105.0 - 112.0	$\pm 3$	Rack	Basic
H	approx. 6.3	275	15.4 - 20.6	$\pm 15$	Rack	
A	8.0	900	105.0 - 112.0	-	Lever	Basic

Timing Advance Specification: EP/SP  
105634-0140

Pump Speed (rpm)	below 550	500	800	1100		
Advance Angle (deg)	START	below 0.5	1.1-2.1	3.5-4.5	Finish (6.5)	

**D2**

ZEXEL - Test values  
Injection pumps

**D3**

ZEXEL - Test values  
Injection pumps







## ■ Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt that the control rack position is 0.5 - 1.0 mm.

## ■ ADJUSTMENT

	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	1105 - 1115 1100	8.0 8.0	<ul style="list-style-type: none"> <li>• Adjust using screw (2)</li> <li>• Adjust using screw (1)</li> </ul>
Torque Control Spring Adjustment	450 - 550 650 - 700	8.4 8.0	<ul style="list-style-type: none"> <li>• Adjust using spring capsule (4)</li> <li>• Confirm</li> <li>• Confirm the torque control stroke is 0.4 mm</li> </ul>
Idling Adjustment	0 275	above 14 6.3	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Adjust using spring capsule (5)</li> <li>• Confirm</li> </ul>
Maximum-speed Adjustment	895 - 905 955 - 975 1105 - 1115	8.0 5.3 8.0	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Confirm speed droop, adjusting using screw (3)</li> <li>• Confirm</li> </ul>
Full-load Adjustment	900	8.0	<ul style="list-style-type: none"> <li>• Adjust using screw (1)</li> </ul>
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>• Measure the control lever angle at the "idling" and "full" positions.</li> <li>• When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Rack Limiter Adjustment	-	-	<ul style="list-style-type: none"> <li>• Adjust using screw</li> </ul>

**D6**
 ZEXEL - Test values  
 Injection pumps
**D7**
 ZEXEL - Test values  
 Injection pumps

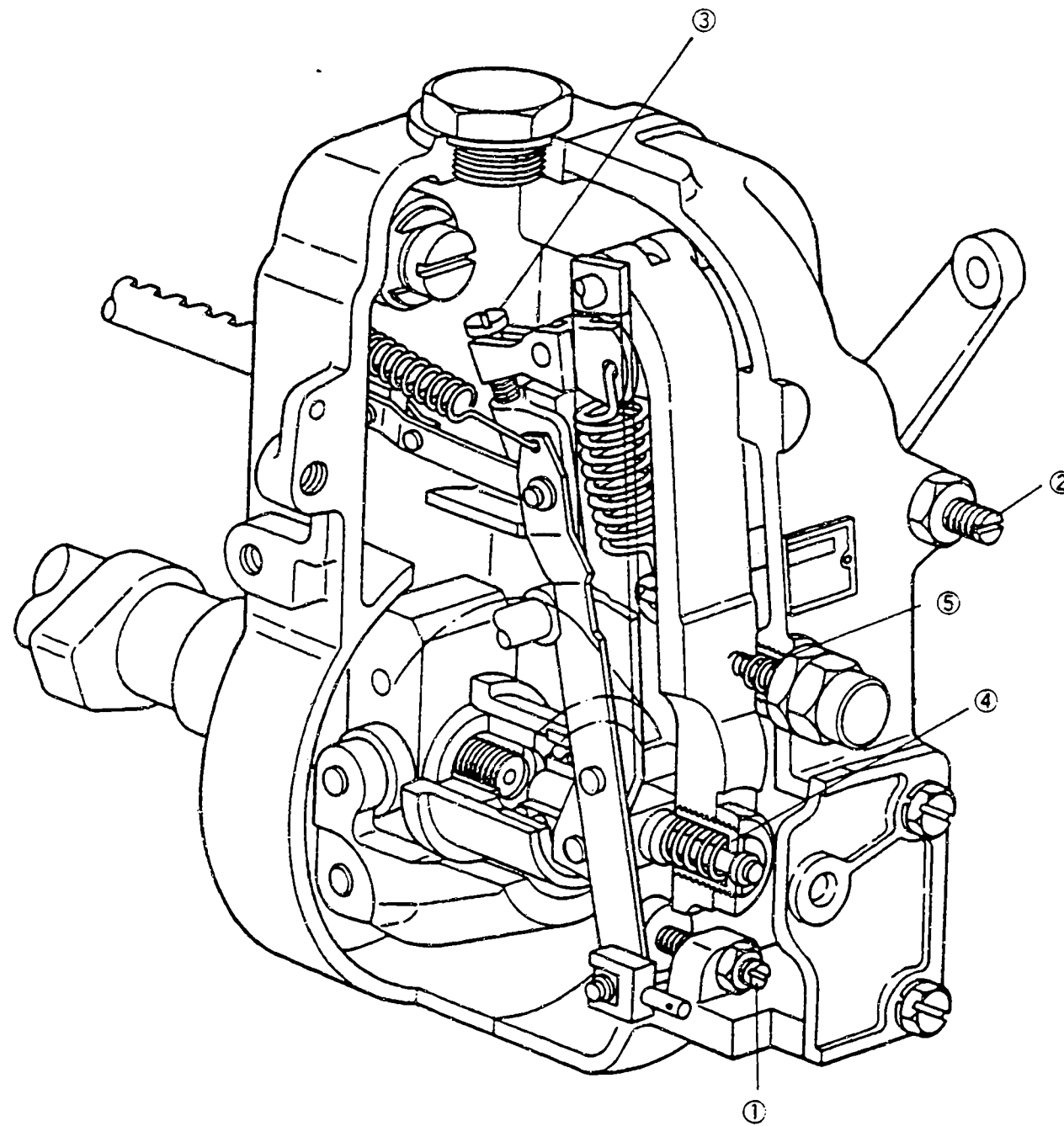



Figure 23

- 1 = Screw
- 2 = Screw
- 3 = Screw
- 4 = Spring capsule
- 5 = Spring capsule

101803-1740 4/4



Test oil:		ZEXEL - TEST VALUES			1/5	
ISO 4113 or		Distributor pumps			BOSCH No. 9 460 610 531	
SAE J967d		Engine model: CD20			ZEXEL No. 104740-2226	
					Date: 31.05.1992 [0]	
					Company: NISSAN	
					No. 16700 60J01	
Injection pump no.: 104640-2226		(NP-VE4/10F2500LNP867)				
Pump rotation: Counter clockwise-viewed from drive side		Test-nozzle holder combination: 1 688 901 022		Test pressure line: 1 680 750 073		
1. Setting values		P. Speed (rpm)	Setting values	Charge-air pressure (mmHg)	Difference (cc)	
1-1	Timing device travel	1000	2.9 - 3.3 (mm)		3.0	
1-2	Supply pump pressure	1000	3.9 - 4.5 (kg/cm²)			
1-3	Full load delivery	1400	36.1 - 37.1 (cc/1000st)			
	Full load delivery		(cc/1000st)			
1-4	Idle speed regulation	350	9.5 - 11.5 (cc/1000st)		2.0	
1-5	Start	100	50.0 - 70.0 (cc/1000st)			
1-6	Full-load speed regulation	2700	12.0 - 16.0 (cc/1000st)		4.5	
1-7	Load-timer adjustment					
2. Test values						
2-1 Timing device		N = rpm	1000	1800	2400	
		mm	2.8 - 3.4	6.2 - 7.4	8.0 - 9.0	
2-2 Supply pump		N = rpm	1000	1800	2400	
		kg/cm²	3.9 - 4.5	5.7 - 6.3	7.1 - 7.9	
2-3 Overflow delivery		N = rpm	1000			
		cc/10s	43.0 - 87.0			
2-4 Fuel injection quantities						
Control lever position		Pump Speed (rpm)	Fuel delivery (cc/1000 strokes)	Charge-air pres (mmHg)	Difference (cc)	
End stop		1400	35.6 - 37.6			
		600	29.8 - 34.8			
		1000	29.4 - 34.4			
		1800	35.0 - 40.0			
		2400	34.1 - 40.1			
		2700	11.5 - 16.5			
		2800	below 5.0			
Switch off		350	0			
Idle		700	below 5.0			
stop		350	9.0 - 12.0			
Partial load		1200	7.3 - 23.3			
2-5 Solenoid		Cut-in voltage max. 8V Test voltage: 12 - 14V				

3. Dimensions		
K	3.2 - 3.4	mm
KF	6.68 - 6.88	mm
MS	0.7 - 0.9	mm
BCS	-	mm
Pre-str.	-	mm
Control lever angle		
α	23° - 27°	deg
Ya	25.7 - 29.7	mm
β	39° - 49°	deg
B	12.2 - 15.6	mm
γ	15.6° - 16.6°	deg
C	10.0 - 10.6	mm

D10

ZEXEL - Test values  
Injection pumps



D11

ZEXEL - Test values  
Injection pumps



Under the following conditions, alter the potentiometer's installation position so that the out-put voltage equals the specified value.

Adjustment Conditions			Specified Value	Remarks
Control lever position	Pump speed (rpm)	Fuel injection quantity (cc/1000st)	Out-put voltage (V)	
approx. 16.1°	1200	Measure	Measure	Adjust. point
Idle	-	-	-	Check point
Full-speed	-	-	-	Check point

(In-put voltage: 10V)

\* A control lever position of approx. 16.1° means that a block gauge of 10.3 mm thickness is inserted between the control lever and the idling stopper bolt.



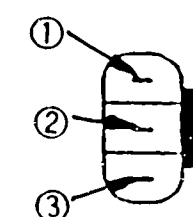
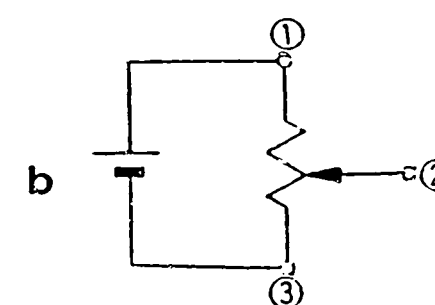
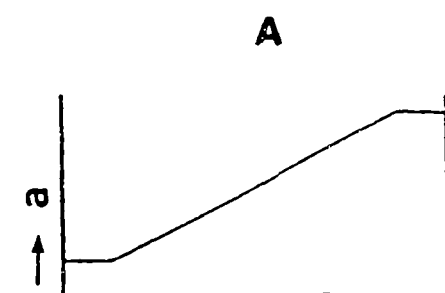
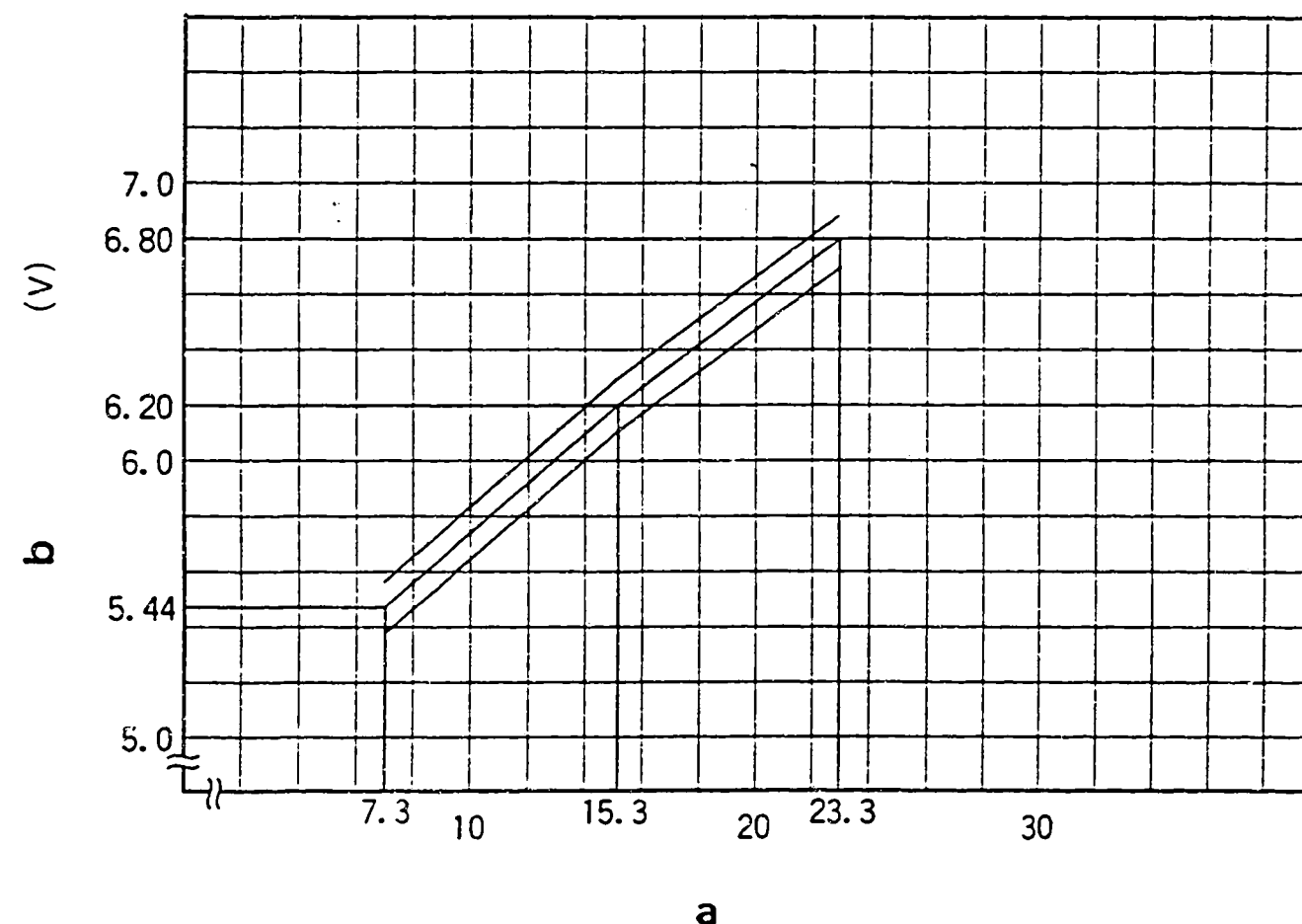


Figure 24

104740-2226 2/5  
(Continuation)

$$V < 14,2 \text{ mm}^3/\text{st}$$

$$V \pm 0,03 = 0,0978 \cdot Q + 4,7259$$

$$Q \geq 14,2 \text{ mm}^3/\text{st}$$

$$V \pm 0,03 = 0,0752 \cdot Q + 5,0457$$

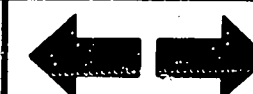
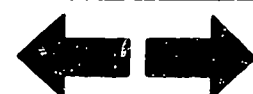
a = Fuel injection quantity (cc/1000st)

b = Out-put voltage

A = Potentiometer connecting diagram

a = Output

b = When connected (2) and (3) →  
then output



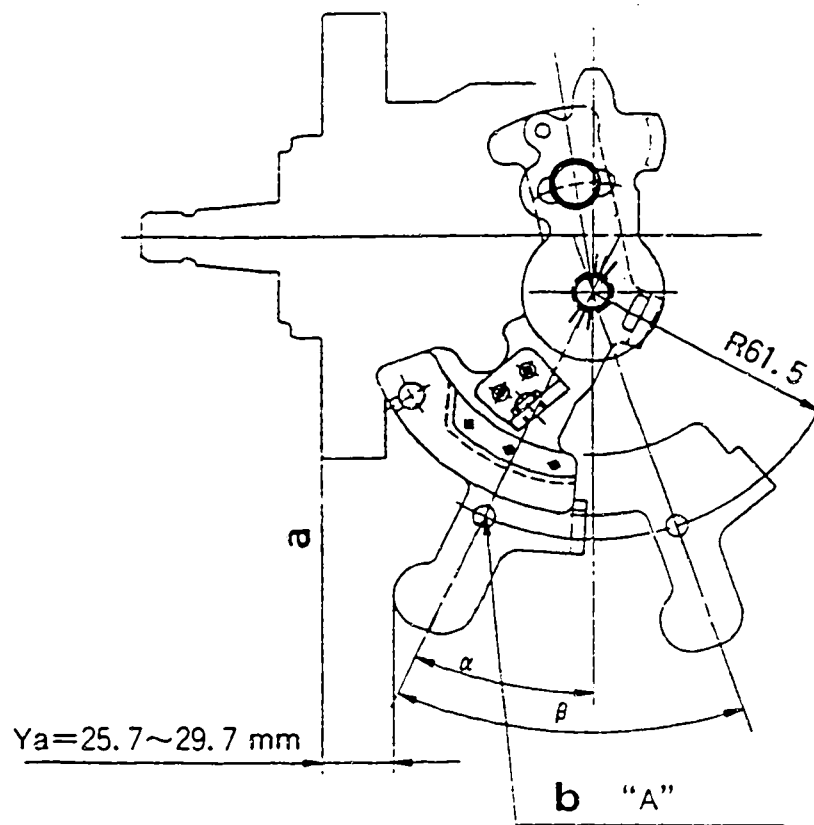


Figure 25

104740-2226 3/5

a = End face of flange  
b = Hole

■ CONTROL LEVER ANGLE MEASUREMENT POSITION

1. Measure the control lever angles ( $\alpha$ ,  $\beta$ ,  $\gamma$ ) at hole A.

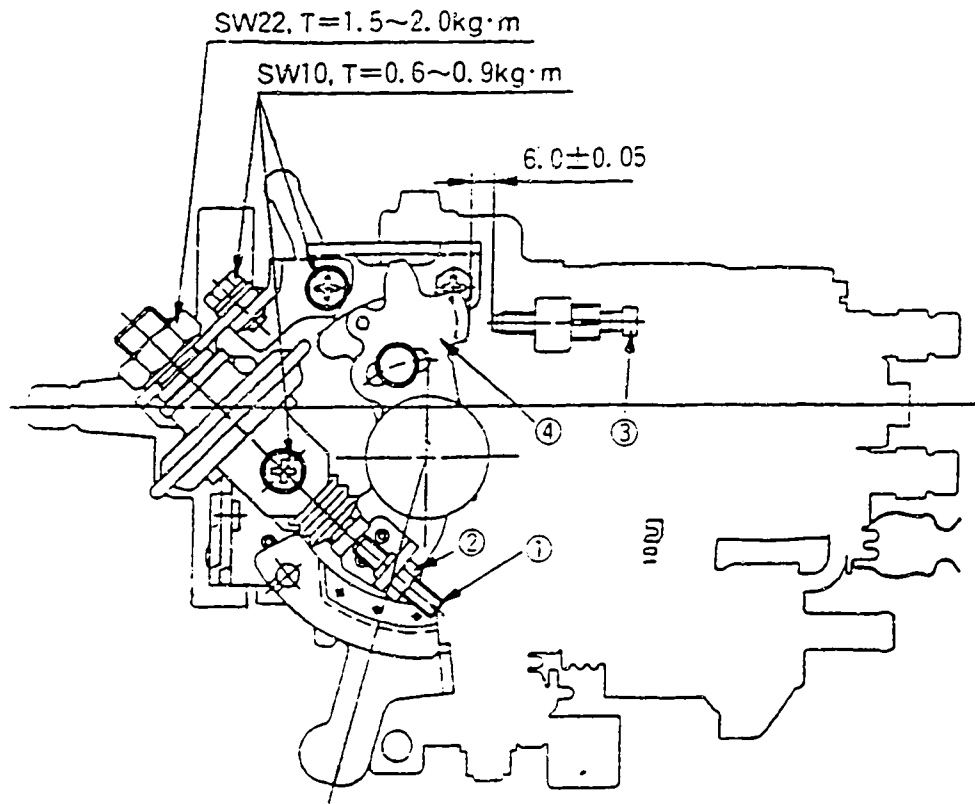


Figure 26

104740-2226 3/5  
(Continuation)

#### ■ DASH POT ADJUSTMENT

1. Insert a block gauge (thickness gauge) of thickness  $6.0 \pm 0.05$  mm in the gap between the control lever and the idling stopper bolt.
2. With the control lever positioned as described in point 1. above, adjust the dashpot adjusting screw so that the dashpot adjusting screw and the push rod are in contact. Fix the screw using the nut.  
T=0.5-0.7 (kgm)

#### Caution:

- The adjusting screw and the pushrod must move together smoothly.
- Confirm that the control lever returns to the idling position.





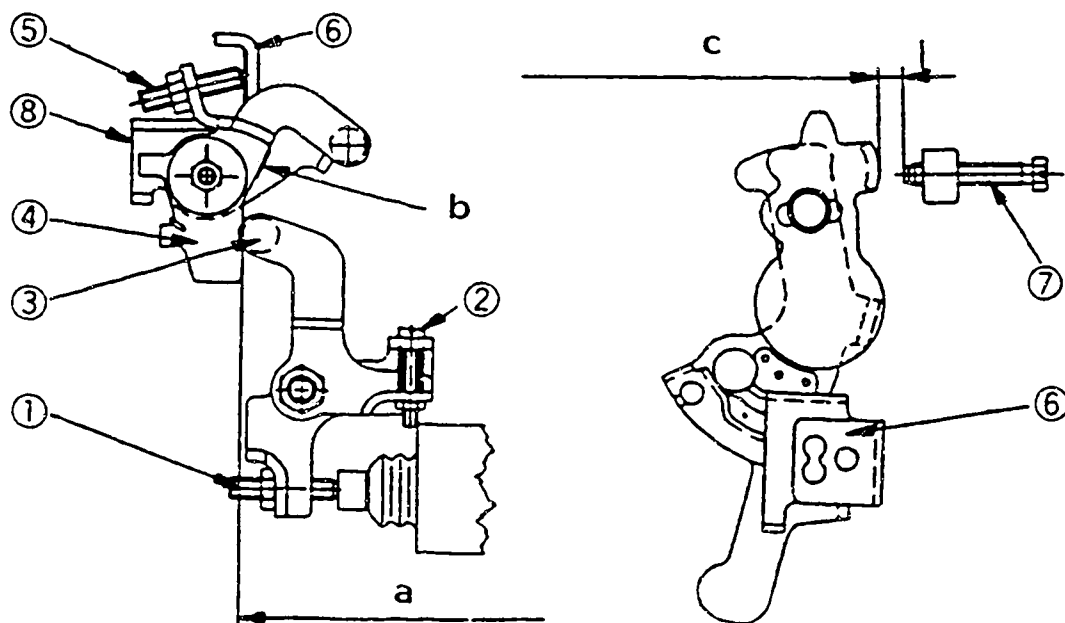


Figure 27

104740-2226 4/5

a = Vertical position

b = Aligning mark

c = Block gauge

## W-CSD ADJUSTMENT

### 1. Intermediate Lever Position Adjustment

- 1) Insert a block gauge (thickness gauge) of  $3.5 \pm 0.05$  mm thickness between the control lever and the idling stopper bolt.
- 2) Insert a block gauge (thickness gauge) of  $5.3 \pm 0.05$  mm thickness between the bracket and the intermediate lever.
- 3) Align the intermediate lever with the aligning mark.
- 4) Adjust the intermediate lever set screw so that the control lever and the intermediate lever set screw are in contact, and then fix in position using the locknut.



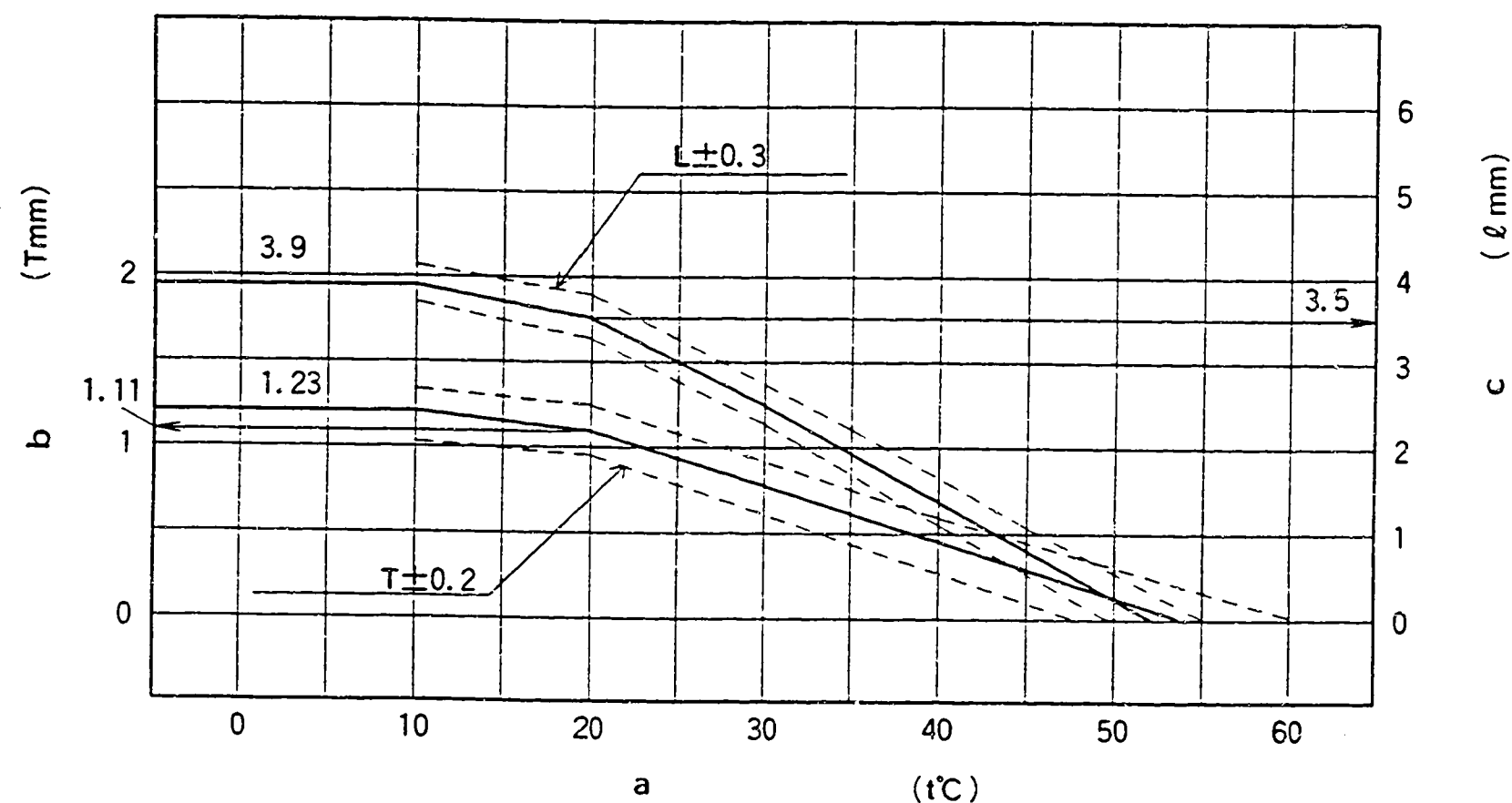


Figure 28

104740-2226 4/5

a = Atmospheric temperature  
b = Timer stroke  
c = Gap between control lever and  
idling stopper bolt

## 2. CSD lever adjustment (adjust to the thick line)

- 1) Calculate the block gauge dimension  $l \pm 0.05$  mm from (Fig. 28) according to the atmospheric temperature at the time of adjustment.
- 2) Insert the block gauge (thickness gauge) between the control lever and the idling stopper bolt.
- 3) In the above condition, adjust screw (2) so that the intermediate lever setting screw contacts the control lever. Then, tighten locknut (1) to fix the screw.

D19

ZEXEL - Test values  
Injection pumps



D20

ZEXEL - Test values  
Injection pumps



**Note:**

- 1. The temperature of the wax must be below 30°C when adjusting.
- 2. When inserting a block gauge (thickness gauge) between the control lever (bracket) and the idling stopper bolt, use the idling adjusting bolt to separate the CSD lever and the intermediate lever so that no excessive force is exerted on them.

$\theta \text{ (}^\circ\text{C)} \leq 10$

$TA = 1,23$

$\theta \text{ (}^\circ\text{C)} \leq 10$

$L = 3,9$

$10 \leq \theta \text{ (}^\circ\text{C)} \leq 20$

$TA = -0,012 \theta + 1,35$

$10 \leq \theta \text{ (}^\circ\text{C)} \leq 20$

$L = -0,04 \theta + 4,3$

$20 \leq \theta \text{ (}^\circ\text{C)} \leq 53,6$

$TA = -0,0330 \theta + 1,77$

$20 \leq \theta \text{ (}^\circ\text{C)} \leq 52,3$

$L = -0,108 \theta + 5,66$



Test Oil		ZEXEL - TEST VALUES				1/2		
ISO 4113 or		Distributor pumps				BOSCH No. 9 460 610 529		
SAE J967d		Engine model: 4D56				ZEXEL No. 104740-8142		
						Date: 31.05.1992 [0]		
						Company: MITSUBISHI		
						No. MD167344		
Injection pump no.: 104640-8142		(NP-VE4/10F2100RNP948)						
Pump rot.: Clockwise-viewed from drive side		Test-nozzle holder combination:				Test pressure line:		
		1 688 901 022				1 680 750 073		
1. Setting values		P. speed (rpm)	Setting values			Charge air pressure (mmHg)	Difference in delivery (cc)	
1-1	Timing device travel	1000	3.5 - 3.9 (mm)			540 - 560	5.0	
1-2	Supply pump pressure	1000	3.9 - 4.5 (kg.cm²)			540 - 560		
1-3	Full load delivery	2000 FULL	64.6 - 65.6 (cc/1000st)			540 - 560		
	Full load delivery	750 BCS	63.4 - 64.4 (cc/1000st)			320 - 340	2.5	
1-4	Idle speed regulation	375	14.9 - 17.9 (cc/1000st)			0		
1-5	Start	100	67.0 - 87.0 (cc/1000st)			0		
1-6	Full-load speed regulation	* 2650	24.9 - 30.9 (cc/1000st)			540 - 560	5.5	
1-7	Load-timer adjustment	1000	T-0.5-0.9 (mm)			540 - 560		
2. Test values								
		Charge air pres. (mmHg)	540 - 560 mmHg					
2-1	Timing device	N = rpm mm	500 0.7-2.3	1000 3.4-4.0	1250 4.1-5.3	1500 5.1-6.3	2000 7.2-8.4	2100 7.3-8.2
2-2	Supply pump	N = rpm kg/cm²		1000 3.9-4.5		1500 5.1-5.7		2100 6.5-7.1
2-3	Overflow delivery	N = rpm cc/10s	1000 46.0-90.0					
2-4 Fuel injection quantities								
Speed control lever pos.		Pump speed (rpm)	Fuel delivery (cc/1000st)	Charge-air pres (mmHg)	Difference in delivery (cc)			
End stop		2000 FULL	64.1 - 66.1	540 - 560				
		750 BCS	62.9 - 64.9	320 - 340				
		600	46.0 - 54.0	0				
		1250	68.2 - 73.2	540 - 560				
		2100	62.5 - 65.5	540 - 560				
		2650	24.4 - 31.4	540 - 560				
		2950	below 5.0	540 - 560				
Switch off		375	0	0				
Idle-stop		750	below 5.0	0				
		375	14.4 - 18.4	0				
2-5 Solenoid		Cut-in voltage max.: 8V Test voltage: 12 - 14V						

3. Dimensions	
K	3.2 - 3.4 mm
KF	5.7 - 5.9 mm
MS	0.6 - 0.8 mm
BCS	- mm
Pre-st.	- mm
Control Lever Angle	
α	55° - 63° Angle
A	9.8 - 16.3 mm
β	37° - 47° Angle
B	11.7 - 15.3 mm
γ	- Angle
C	- mm



1. Adjustment

1) Fix the control lever in the position satisfying the following conditions:

Boost Pressure: 540-560 mmHg  
 Pump Speed : 1000 rpm  
 Fuel Injection Quantity: 49.5 - 50.5 cc/1000st

2) With the control lever positioned as described in 1) above, adjust the governor sleeve so that the Timer Stroke conforms to the specified values (1-7).

2. Confirmation of Timer Characteristics

Fix the control lever in the position satisfying the following conditions, and confirm the Timer Stroke.

Control lever position			Specified values	
Pump speed (rpm)	Fuel injection quantity (cc/1000st)	Boost pressure (mmHg)	Timer stroke (mm)	Timer stroke reduction value (mm)
1000	49.0 - 51.0	540 - 560	-	0.3 - 1.1
1000	38.5 - 41.5	540 - 560	-	1.2 - 2.4

Note:

For items marked \*, confirmation is as follows:

1. Insert the shims (1.0 mm thick) between the control lever and the full-speed stopper bolt.
2. Confirm the fuel injection quantity at the specified pump speed.



Test oil ISO 4113 or SAE J967d		ZEXEL - TEST VALUES Distributor pumps Engine model: 4D56				1/2 BOSCH No. 9 460 610 528 ZEXEL No. 104740-8250 Date: 31.05.1992 [2] Company: MITSUBISHI No. MD171998	
Injection pump no.: 104640-8250			(NP-VE4/10F2100RNP969)				
Pump rot.: Clockwise-viewed from drive side			Test-nozzle holder combination: 1 688 901 000			Test pressure line: 1 680 750 017	
1. Setting values			P. Speed (rpm)	Setting values		Charge-air pressure bar (mmHg)	Difference in delivery (cc)
1-1	Timing device travel		1250	3.5 - 3.9 (mm)			3.0
1-2	Supply pump pressure		1250	4.5 - 5.1 (kg/cm²)			
1-3	Full load delivery		1250	45.3 - 46.3 (cc/1000st)			
	Full load delivery			(cc/1000st)			
1-4	Idle speed regulation		375	6.5 - 9.5 (cc/1000st)			2.0
1-5	Start		100	63.0 - 83.0 (cc/1000st)			
1-6	Full-load speed regulation		2550	15.1 - 21.1 (cc/1000st)			4.0
1-7	Load-timer adjustment		1250	T = 0.4-0.8 (mm)			
2. Test values							
2-1 Timing device		N = rpm mm	500 0.6-1.8	750 1.4-2.6	1250 3.3-4.1	2100 6.6-7.8	
2-2 Supply pump		N = rpm kg/cm²		600 2.9-3.5	1250 4.5-5.1	2100 6.5-7.1	
2-3 Overflow delivery		N = rpm cc/10s			1250 48.0-92.0		
2-4 Fuel injection quantities							
Speed control lever pos.		P. Speed (rpm)	Fuel delivery (cc/1000st)		Charge-air pres (mmHg)	Difference in delivery (cc)	
End stop		1250	44.8 - 46.8				
		600	42.3 - 46.3				
		2100	37.2 - 41.2				
		2550	14.6 - 21.6				
		2900	below 5.0				
Switch off		375	0				
Idle- stop		600	below 3.0				
		375	6.0 - 10.0				
2-5 Solenoid		Cut-in voltage max.:8V Test voltage: 12 - 14V					

3. Dimensions		
K	3.2 - 3.4 mm	
KF	5.7 - 5.9 mm	
MS	1.1 - 1.3 mm	
BCS	- mm	
Pre-st.	- mm	
Control lever angle		
α	19° - 27° deg	
A	10.9 - 16.0 mm	
β	36° - 46° deg	
B	11.4 - 15.0 mm	
γ	- deg	
C	- mm	

E1

ZEXEL - Test values  
Injection pumps



E2

ZEXEL - Test values  
Injection pumps



1. Adjustment

1) Fix the control lever in the position satisfying the following conditions:

Boost Pressure: - mmHg  
Pump Speed : 1250 rpm  
Fuel Injection Quantity: 34.7 - 36.7 cc/1000st

2) With the control lever positioned as described in 1) above, adjust the governor sleeve so that the Timer Stroke conforms to the specified values (item 1-7).

2. Confirmation of Timer Characteristics

Fix the control lever in the position satisfying the following conditions, and confirm the Timer Stroke.

Control lever position			Specified values	
Pump speed (rpm)	Fuel injection quantity (cc/1000st)	Boost pressure (mmHg)	Timer stroke (mm)	Timer stroke reduction value (mm)
1250	34.7 - 36.7	-	3.1	0.2 - 1.0
1250	26.7 - 29.7	-	2.3	0.8 - 2.0

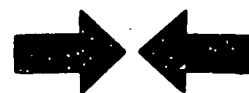


Test oil ISO 4113 or SAE J967d		ZEXEL - TEST VALUES Distributor pumps Engine model: D201-02		BOSCH No. 9 460 610 526 ZEXEL No. 104741-5322 Date: 31.05.1992 [0] Company: ISUZU No. 89702 66733		
Injection pump no.: 104641-5322		(NP-VE4/11F1050LNP959)				
Pump rot.: Counter Clockwise-viewed from drive side		Test-nozzle holder combination: 1 688 901 022		Test pressure line: 1 680 750 073		
1. Setting values		P. Speed (rpm)	Setting values	Charge-air pressure bar (mmHg)	Difference in delivery (cc)	
1-1	Timing device travel	1100	1.4 - 1.8 (mm)		3.0	
1-2	Supply pump pressure	1100	5.1 - 5.5 (kg/cm²)			
1-3	Full load delivery	800	29.2 - 30.2 (cc/1000st)			
	Full load delivery		- (cc/1000st)		3.0	
1-4	Idle speed regulation	500	19.7 - 21.7 (cc/1000st)			
1-5	Start	100	above 70.0 (cc/1000st)		3.0	
1-6	Full-load speed regulation	1100	24.0 - 26.0 (cc/1000st)			
1-7	Load-timer adjustment					
2. Test values						
2-1	Timing device	N = rpm mm	1100 1.3 - 1.9	3. Dimensions		
2-2	Supply pump	N = rpm kg/cm²	1100 5.1 - 5.5			
2-3	Overflow delivery	N = rpm cc/10s	1050 48.3 - 91.7			
2-4 Fuel injection quantities						
Speed control lever pos.	P. Speed (rpm)	Fuel delivery (cc/1000st)	Charge-air pres (mmHg)			Difference in delivery (cc)
End stop	800	28.7 - 30.7				
	1050	32.2 - 37.2				
	1100	23.5 - 26.5				
	1200	below 3.0				
Switch off	500	0				
Idle-stop	600	below 3.0				
	500	19.7 - 21.7				
2-5	Cut-in voltage max.:8V Test voltage: 12 - 14V					
Solenoid						
				</		

E5

ZEXEL - Test values

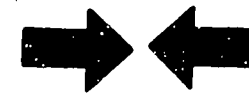
Injection pumps



E6

ZEXEL - Test values

Injection pumps





Test oil  
ISO 4113 or  
SAE J967d

ZEXEL - TEST VALUES  
Distributor pumps  
Engine model: D201

BOSCH No. 9 460 610 527  
ZEXEL No. 104741-6591  
Date: 31.05.1992 [2]  
Company: ISUZU  
No. 89438 10331

Injection pump no.: 104641-6591

(NP-VE4/11F1050LNP834)

Pump rot.: Counter Clockwise-viewed from  
drive side

Test-nozzle holder combination:  
1 688 901 022

Test pressure line:  
1 680 750 073

### 1. Setting values

	P. Speed (rpm)	Setting values	Charge-air pressure bar (mmHg)	Difference in delivery (cc)
1-1 Timing device travel	1100	1.4 - 1.8 (mm)		
1-2 Supply pump pressure	1100	5.1 - 5.5 (kg/cm <sup>2</sup> )		
1-3 Full load delivery	800	29.2 - 30.2 (cc/1000st)		3.0
Full load delivery		- (cc/1000st)		
1-4 Idle speed regulation	700	14.6 - 18.6 (cc/1000st)		3.0
1-5 Start	100	above 80.0 (cc/1000st)		
1-6 Full-load speed regulation	1100	24.0 - 26.0 (cc/1000st)		3.0
1-7 Load-timer adjustment				

### 2. Test values

2-1 Timing device	N = rpm mm	580-780 0.5		1100 1.4-1.8	
2-2 Supply pump	N = rpm kg/cm <sup>2</sup>	700 4.0-4.6		1100 5.1-5.5	
2-3 Overflow delivery	N = rpm cc/10s		1050 48.3-91.7		

### 2-4 Fuel injection quantities

Speed control lever pos.	P. Speed (rpm)	Fuel delivery (cc/1000st)	Charge-air pres (mmHg)	Difference in delivery (cc)
End stop	800	28.7 - 30.7		
	700	28.3 - 33.3		
	900	31.7 - 35.7		
	1000	32.7 - 36.7		
	1050	31.1 - 36.1		
	1100	23.5 - 26.5		
	1150	7.1 - 14.1		
	1200	below 3.0		
Switch off	700	0		
Idle- stop	700	14.6 - 18.6		
	800	below 4.5		

2-5 Solenoid Cut-in voltage max.: 8V  
Test voltage: 12 - 14V

### 3. Dimensions

K	2.7 - 2.9 mm
KF	4.9 - 5.1 mm
MS	2.0 - 2.2 mm
BCS	- mm
Pre-st.	0.43 - 0.47 mm
Control lever angle	
α	3° - 11° deg
A	16.0 - 21.0 mm
β	4° - 14° deg
B	1.26 - 4.60 mm
γ	- deg
C	- mm

E7

ZEXEL - Test values  
Injection pumps



E8

ZEXEL - Test values  
Injection pumps



Test oil:		ZEXEL - TEST VALUES			1/2	
ISO 4113 or		Distributor pumps			BOSCH No. 9 460 610 532	
SAE J967d		Engine model: CD17			ZEXEL No. 104748-2371	
					Date: 31.05.1992 [0]	
					Company: NISSAN	
					No. 16700 16A63	
Injection pump no.: 104648-2181		(NP-VE4/8F2500LNP164)				
Pump rotation.: Counter clockwise-viewed from drive side		Test-nozzle holder combination: 1 688 901 000		Test pressure line: 1 680 750 017		
1. Setting values		P. Speed (rpm)	Setting values	Charge-air pressure (mmHg)	Difference in delivery (cc)	
1-1	Timing device travel	1200	1.8 - 2.4 (mm)		2.5	
1-2	Supply pump pressure	1200	3.1 - 3.7 (kg/cm²)			
1-3	Full load delivery	1200	29.5 - 30.5 (cc/1000st)			
	Full load delivery		(cc/1000st)			
1-4	Idle speed regulation	400	5.3 - 8.3 (cc/1000st)			
1-5	Start	100	45.3 - 55.3 (cc/1000st)			
1-6	Full-load speed regulation	2700	11.9 - 17.9 (cc/1000st)			
1-7						
2. Test values						
2-1 Timing device		N = rpm	1200	1800	2500	
		mm	1.7 - 2.5	4.0 - 5.2	6.8 - 8.0	
2-2 Supply pump		N = rpm	1200	1800	2500	
		kg/cm²	3.0 - 3.8	4.4 - 5.2	6.1 - 6.9	
2-3 Overflow delivery		N = rpm	1200			
		cc/10s	36.0 - 80.0			
2-4 Fuel injection quantities						
Control lever position		Pump Speed (rpm)	Fuel delivery (cc/1000 strokes)	Charge-air pres (mmHg)	Difference in delivery (cc)	
End stop		1000	29.0 - 31.0			
		600	24.8 - 28.8			
		2500	26.7 - 30.7			
		2700	11.4 - 18.4			
		2900	below 6.0			
Switch off		400	0			
Idle		400	4.8 - 8.8	2.5		
stop		600	below 3.0			
Partial load		700	10.0 - 20.0			
2-5 Solenoid		Cut-in voltage max.: 8V Test voltage: 12 - 14V				

3. Dimensions		
K	3.2 - 3.4 mm	
KF	5.7 - 5.9 mm	
MS	1.5 - 1.7 mm	
BCS	- mm	
Pre-str.	- mm	
Control lever angle		
α	1° - -1° deg	
A	15.4 - 18.1 mm	
β	39° - 49° deg	
B	11.0 - 16.0 mm	
γ	13.5° - 14.5°deg	
C	8.6 - 9.2 mm	

E9

ZEXEL - Test values  
Injection pumps



E10

ZEXEL - Test values  
Injection pumps



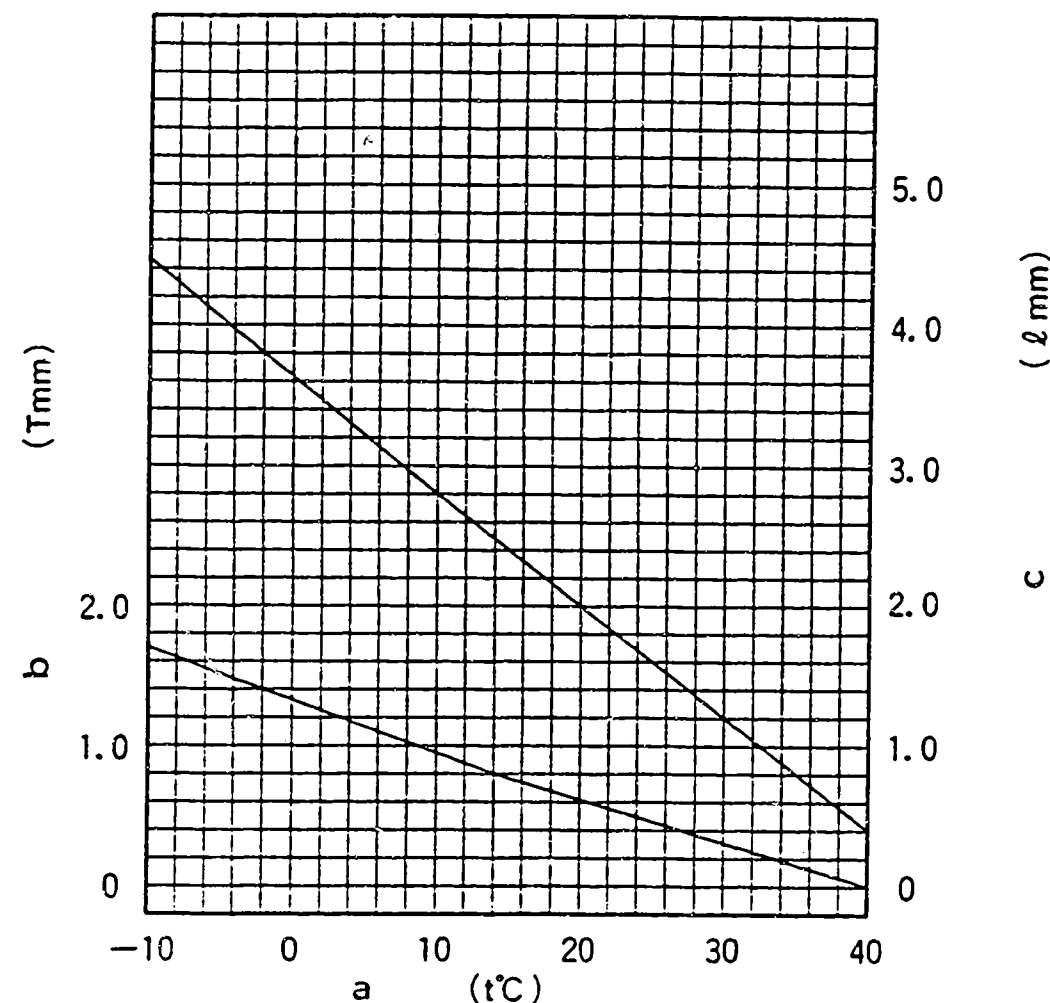
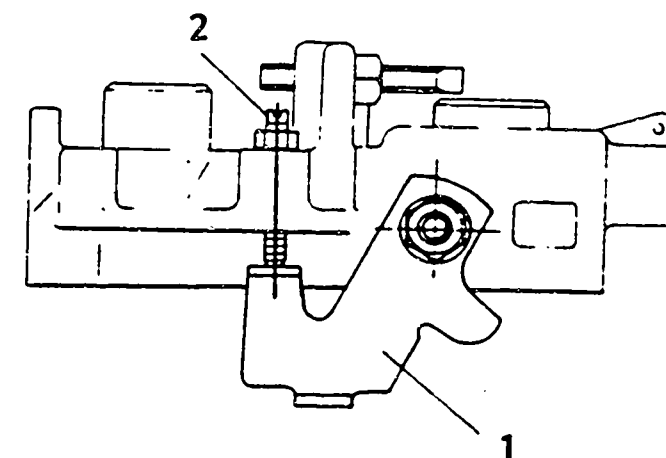


Figure 29

a = Atmospheric temperature  
b = Timer stroke  
c = Gap between control lever and idling stopper screw

Figure 30

1 = Stop lever  
2 = Adjusting screw



104748-2371 2/2

# W-CSD ADJUSTMENT

## 1. Timer Stroke Adjustment (adjust to the thick line)

1) Calculate the timer stroke from Fig. 29 (diagram) according to the atmospheric temperature at the time of adjustment.

## 2. Intermediate Lever Position Adjustment

2) Insert a block gauge (thickness gauge) of  $1.9 \pm 0.05$  mm thickness between the control lever and the idling stopper screw.

## STARTING INJECTION QUANTITY ADJUSTMENT

Adjust the starting injection quantity (item 1-5) using the adjusting screw (as shown in the figure above).

E11

ZEXEL - Test values  
Injection pumps



E12

ZEXEL - Test values  
Injection pumps



Test oil:		ZEXEL - TEST VALUES				1/4	
ISO 4113 or		Distributor pumps				BOSCH No. 9 460 610 533	
SAE J967d		Engine model: CD17				ZEXEL No. 104748-2381	
						Date: 31.05.1992 [0]	
						Company: NISSAN	
						No. 16700 16A68	
Injection pump no: 104648-2181		(NP-VE4/8F2500LNP164)					
Pump rotation: Counter clockwise-viewed from drive side		Test-nozzle holder combination: 1 688 901 000				Test pressure line: 1 680 750 017	
1. Setting values		P. Speed (rpm)	Setting values		Charge-air pressure (mmHg)	Difference (cc)	
1-1	Timing device travel	1200	1.8 - 2.4 (mm)			2.5	
1-2	Supply pump pressure	1200	3.1 - 3.7 (kg/cm²)				
1-3	Full load delivery	1200	29.5 - 30.5 (cc/1000st)				
	Full load delivery		(cc/1000st)				
1-4	Idle speed regulation	400	8.3 - 11.3 (cc/1000st)				
1-5	Start	100	45.3 - 55.3 (cc/1000st)				
1-6	Full-load speed regulation	2700	11.9 - 17.9 (cc/1000st)				
1-7	Load-timer adjustment						
1-8							
2. Test values							
2-1 Timing device		N = rpm mm	1200 1.7 - 2.5	1800 4.0 - 5.2	2500 6.8 - 8.0	3. Dimensions	
2-2 Supply pump		N = rpm kg/cm²	1200 3.0 - 3.8	1800 4.4 - 5.2	2500 6.1 - 6.9		
2-3 Overflow delivery		N = rpm cc/10s	1200 36.0 - 80.0				
2-4 Fuel injection quantities							
Control lever position		Pump Speed (rpm)	Fuel delivery (cc/1000 strokes)	Charge-air pres (mmHg)	Difference (cc)		
End stop		1200	29.0 - 31.0				
		600	24.8 - 28.8				
		2500	26.7 - 30.7				
		2700	11.4 - 18.4				
		2900	below 6.0				
Switch off		400	0				
Idle stop		400	7.8 - 11.8	2.5			
		600	below 3.0				
Partial load		700	13.3 - 20.0				
2-5 Solenoid		Cut-in voltage max. 8 V Test voltage: 12 - 14 V					

E13

ZEXEL - Test values  
Injection pumps



E14

ZEXEL - Test values  
Injection pumps



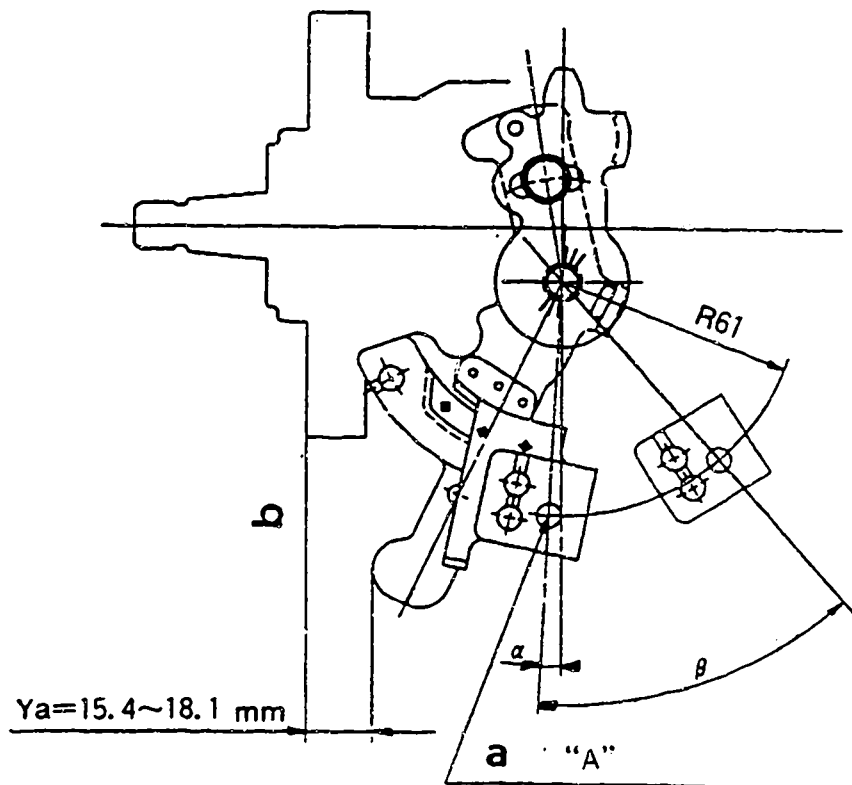


Figure 31

104748-2381 2/4

a = Hole „A“

b = End face of flange

# ■ CONTROL LEVER ANGLE MEASUREMENT POSITION

1. Measure the control lever angles ( $\alpha$ ,  $\beta$ ,  $\gamma$ ) at hole "A".

## 2. Marking Positions

The control lever is marked (painted) at the positions (shown above), depending on the value of control lever angle  $\beta$ .

Position "a":  $\Rightarrow \beta \leq 39.5^\circ$  (B = 11.7 mm)

Position "b":  $\Rightarrow \begin{matrix} 39.5^\circ & (B = 11.7 \text{ mm}) \\ < \beta \leq 42.5^\circ & (B = 13.0 \text{ mm}) \end{matrix}$

Position "c":  $\Rightarrow \beta > 42.5^\circ$  (B = 13.0 mm)



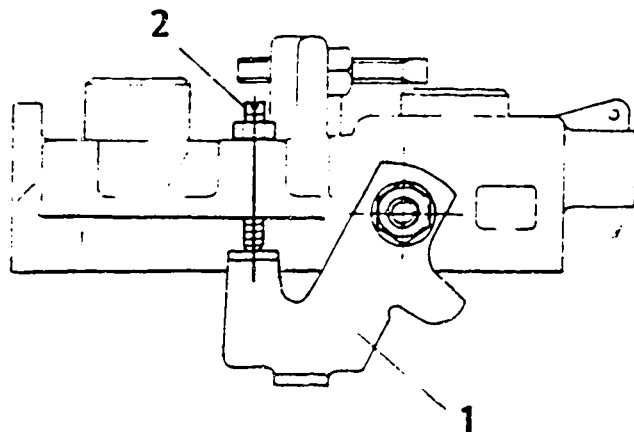


Figure 32

104748-2381 2/4  
(continued)

- 1 = Stop lever
- 2 = Adjusting screw

#### ■ STARTING INJECTION QUANTITY ADJUSTMENT

Adjust the starting injection quantity (item 1-5) using the adjusting screw (as shown in the figure above).



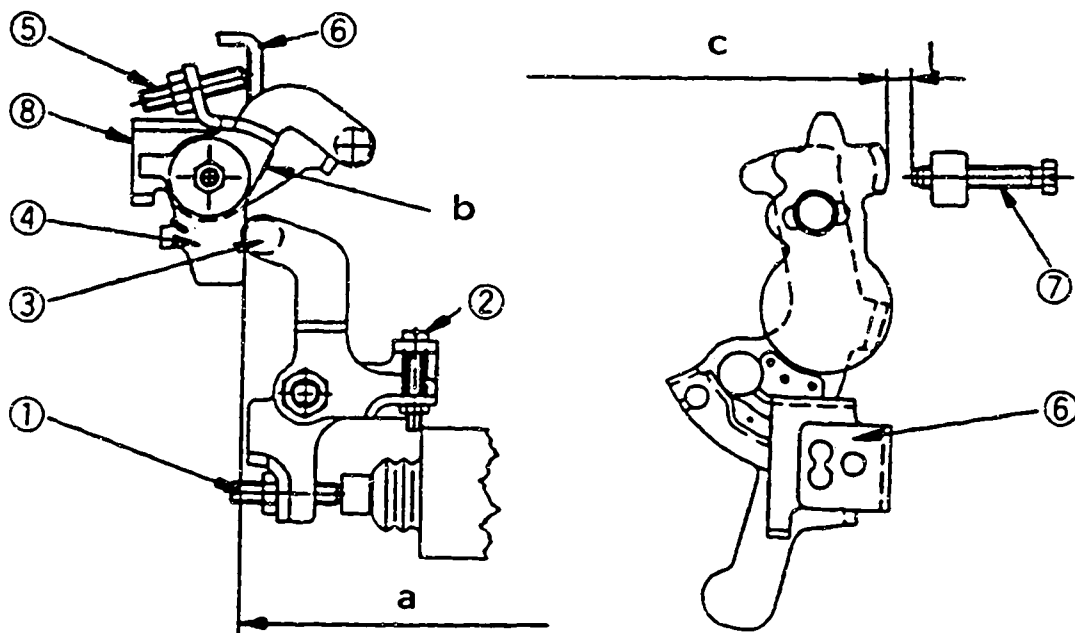


Figure 33

104748-2381 3/4

a = Vertical position

b = Aligning mark

c = Block gauge

## ■ W-CSD ADJUSTMENT

### 1. Timer Stroke Adjustment

- 1) Calculate the timer stroke from Fig. 34 according to the atmospheric temperature at the time of adjustment.
- 2) Adjust using the screw (1) so that the timer stroke is as calculated in step 1.



**2. Intermediate Lever Position Adjustment (continued)**

- 1) Insert a block gauge (thickness gauge) of  $1.9 \pm 0.05$  mm thickness between the control lever and the idling stopper bolt.
- 2) Align the intermediate lever with the aligning mark.
- 3) Adjust the intermediate lever set screw so that the control lever and the intermediate lever set screw are in contact, and then fix in position using the locknut.





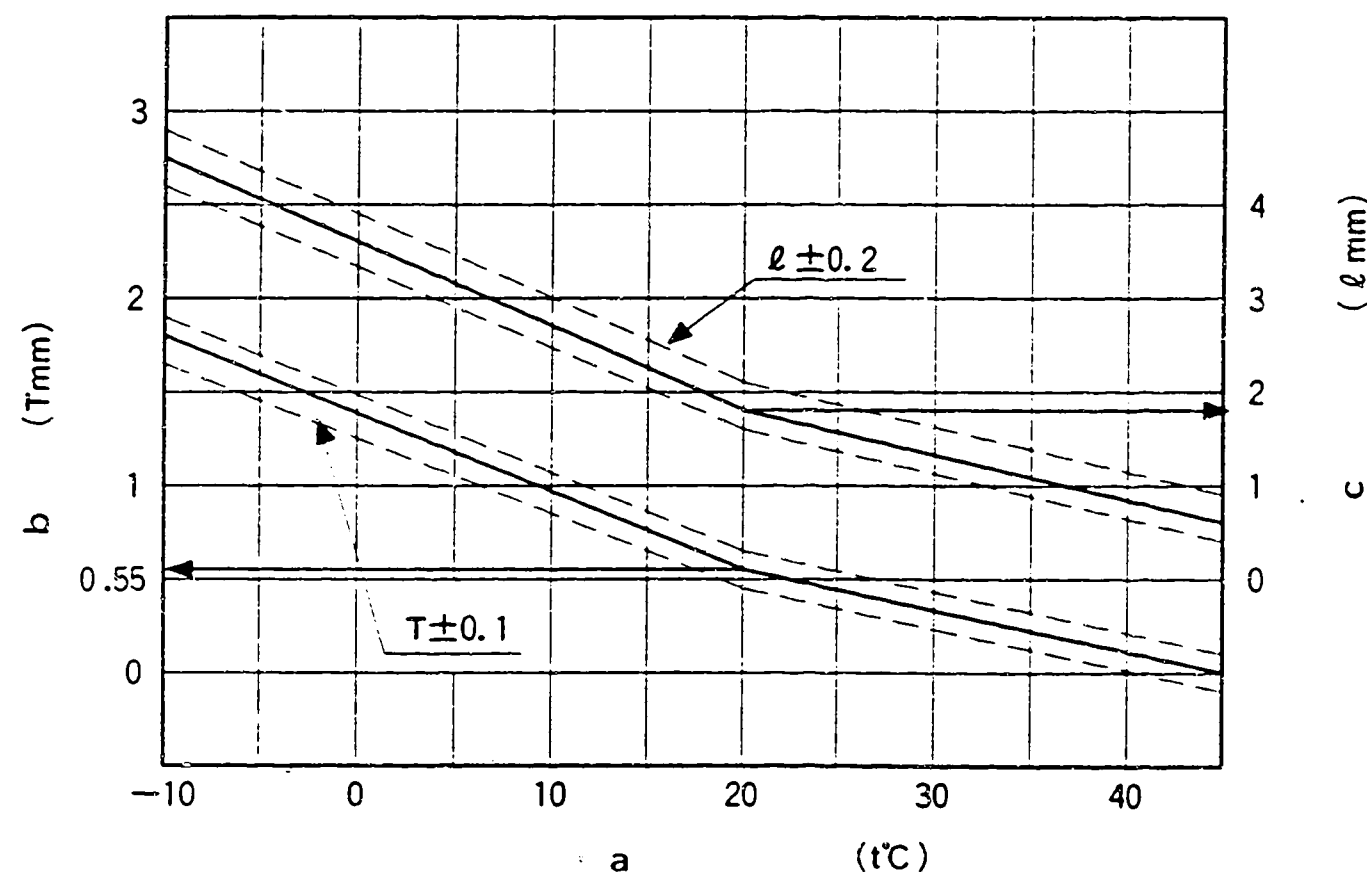


Figure 34

104748-2381 3/4

a = Atmospheric temperature  
b = Timer stroke  
c = Gap between control lever  
and idling stopper bolt

### 3. CSD Lever Adjustment (adjust to the thick line)

- 1) Calculate the block gauge dimension  $l \pm 0.05$  mm from (Fig. 34) according to the atmospheric temperature at the time of adjustment.
- 2) Insert the block gauge (thickness gauge) between the control lever and the idling stopper bolt.
- 3) Using the idling bolt, adjust so that the CSD lever roller and the intermediate lever are in contact.

**E19**

ZEXEL - Test values  
Injection pumps



**E20**

ZEXEL - Test values  
Injection pumps



#### 4. Final Adjustment

After completing the adjustment, screw the timer stroke adjusting screw two turns clockwise.

(Move from the temporary adjustment chart to the final adjustment chart).

- \* This W-CSD's timer stroke operations are effective at atmospheric temperatures of 30°C or above. Therefore, to make adjustment at normal temperatures possible, after adjusting to the substitute characteristics, tighten the timer stroke adjusting screw two turns.

$$-10 \leq \theta (^{\circ}\text{C}) \leq 20$$

$$TA = -0.0367 \theta + 1.284$$

$$20 \leq \theta (^{\circ}\text{C}) \leq 40$$

$$TA = -0.0275 \theta + 1.1$$

$$-10 \leq \theta (^{\circ}\text{C}) \leq 20$$

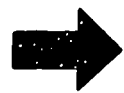
$$l = -0.0867 \theta + 3.63$$

$$20 \leq \theta (^{\circ}\text{C}) \leq 40$$

$$l = -0.075 \theta + 3.4$$



Test oil:		ZEXEL - TEST VALUES			1/2	
ISO 4113 or		Distributor pumps			BOSCH No. 9 460 610 534	
SAE J967d		Engine model: CD17			ZEXEL No. 104748-2391	
					Date: 31.05.1992 [0]	
					Company: NISSAN	
					No. 16700 16A73	
Injection pump no.: 104648-2181		(NP-VE4/8F2500LNP164)				
Pump rotation.: Counter clockwise-viewed from drive side		Test-nozzle holder combination: 1 686 901 000		Test pressure line: 1 680 750 017		
1. Setting values		P. Speed (rpm)	Setting values	Charge-air pressure (mmHg)	Difference in delivery (cc)	
1-1	Timing device travel	1200	1.8 - 2.4 (mm)		2.5	
1-2	Supply pump pressure	1200	3.1 - 3.7 (kg/cm²)			
1-3	Full load delivery	1200	29.5 - 30.5 (cc/1000st)			
	Full load delivery		(cc/1000st)			
1-4	Idle speed regulation	400	5.3 - 8.3 (cc/1000st)			
1-5	Start	100	45.3 - 55.3 (cc/1000st)			
1-6	Full-load speed regulation	2700	11.9 - 17.9 (cc/1000st)			
1-7						
2. Test values						
2-1 Timing device		N = rpm mm	1200 1.7 - 2.5	1800 4.0 - 5.2	2500 6.8 - 8.0	
2-2 Supply pump		N = rpm kg/cm²	1200 3.0 - 3.8	1800 4.4 - 5.2	2500 6.1 - 6.9	
2-3 Overflow delivery		N = rpm cc/10s	1200 36.0 - 80.0			
2-4 Fuel injection quantities						
Control lever position		Pump Speed (rpm)	Fuel delivery (cc/1000 strokes)	Charge-air pres (mmHg)	Difference in delivery (cc)	
End stop		1200	29.0 - 31.0			
		600	24.8 - 28.8			
		2500	26.7 - 30.7			
		2700	11.4 - 18.4			
		2900	below 6.0			
Switch off		400	0			
Idle stop		400	4.8 - 8.8	2.5		
		600	below 3.0			
Partial load		700	10.0 - 20.0			
2-5 Solenoid		Cut-in voltage max.: 8V Test voltage: 12 - 14V				
3. Dimensions						
K	3.2 - 3.4 mm					
KF	5.7 - 5.9 mm					
MS	1.5 - 1.7 mm					
BCS	- mm					
Pre-str.	- mm					
Control lever angle						
α	1° - -1° deg					
A	15.4 - 18.1 mm					
β	39° - 49° deg					
B	11.0 - 16.0 mm					
γ	13.5° - 14.5° deg					
C	8.6 - 9.2 mm					



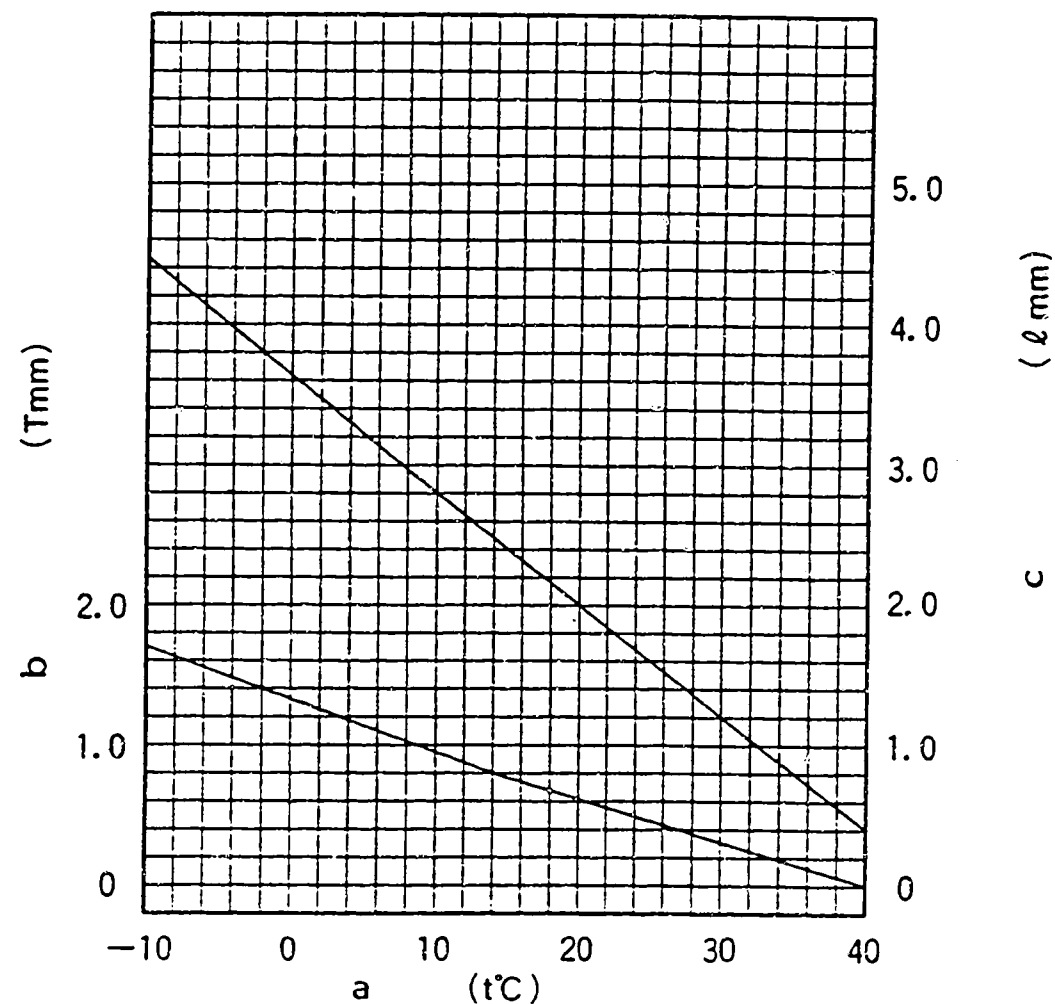


Figure 35

a = Atmospheric temperature

b = Timer stroke

c = Gap between control lever and idling stopper screw

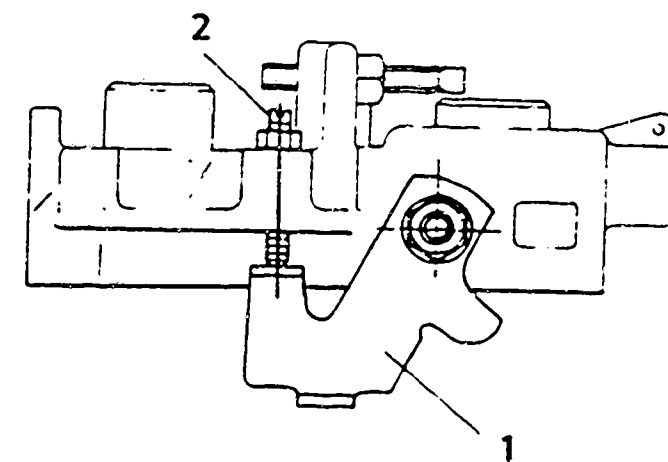


Figure 36

1 = Stop lever

2 = Adjusting screw

104748-2391 2/2

#### W-CSD ADJUSTMENT

##### 1. Timer Stroke Adjustment (adjust to the thick line)

1) Calculate the timer stroke from Fig. 35 (diagram) according to the atmospheric temperature at the time of adjustment.

##### 2. Intermediate Lever Position Adjustment

2) Insert a block gauge (thickness gauge) of  $1.9 \pm 0.05$  mm thickness between the control lever and the idling stopper screw.

#### STARTING INJECTION QUANTITY ADJUSTMENT

Adjust the starting injection quantity (item 1-5) using the adjusting screw (as shown in the figure above).

E24

ZEXEL - Test values

Injection pumps



E25

ZEXEL - Test values

Injection pumps



Test oil		ZEXEL - TEST VALUES				1/5	
ISO 4113 or		Distributor pumps				BOSCH No. 9 460 610 535	
SAE J967d		Engine model: CD17				ZEXEL No. 104748-2462	
						Date: 31.05.1992 [0]	
						Company: NISSAN	
						No. 16700 56M00	
Injection pump no.: 104648-2462		(NP-VE4/8F2500LNP455)					
Pump rot.: Counter Clockwise-viewed from drive side		Test-nozzle holder combination: 1 688 901 000				Test pressure line: 1 680 750 017	
1. Setting values		P. Speed (rpm)	Setting values			Charge-air pressure (mmHg)	Difference in delivery (cc)
1-1	Timing device travel	1200	2.6 - 3.2 (mm)				2.5
1-2	Supply pump pressure	1200	3.5 - 4.1 (kg/cm²)				
1-3	Full load delivery	1000	27.1 - 28.1 (cc/1000st)				
	Full load delivery		(cc/1000st)				
1-4	Idle speed regulation	360	3.7 - 6.7 (cc/1000st)				2.5
1-5	Start	100	50.3 - 70.3 (cc/1000st)				
1-6	Full-load speed regulation	2700	11.8 - 17.8 (cc/1000st)				5.0
1-7	Load-timer adjustment	1200	T-0.4 - 0.8 (mm)				5.0
2. Test values							
2-1 Timing device		N = rpm	1200	1800	2500		
		mm	2.5 - 3.3	5.0 - 5.8	7.7 - 8.6		
2-2 Supply pump		N = rpm	1200	1800	2500		
		kg/cm²	3.4 - 4.2	4.8 - 5.6	6.4 - 7.2		
2-3 Overflow delivery		N = rpm	1200				
		cc/10s	36.0-80.0				
2-4 Fuel injection quantities							
Speed control lever pos.		P. Speed (rpm)	Fuel delivery (cc/1000st)	Charge-air pres (mmHg)	Difference in delivery (cc)		
End stop		1000	26.6 - 28.6		2.5		
		600	24.8 - 28.8				
		2500	24.3 - 28.3				
		2700	11.3 - 18.3		5.0		
		2900	below 6.0				
Switch off		360	0				
Idle-stop		360	3.2 - 7.2	2.5			
		600	below 3.0				
Partial load		700	10.8 - 19.8				
2-5 Solenoid		Cut-in voltage max.:8V Test voltage: 12 - 14V					
3. Dimensions							
K	3.2 - 3.4 mm						
KF	5.7 - 5.9 mm						
MS	1.7 - 1.9 mm						
BCS	- mm						
Pre-st.	- mm						
Control lever angle							
α	1° - -1° deg						
Ya	15.4 - 18.1 mm						
β	39° - 49° deg						
B	11.0 - 16.0 mm						
γ	13.5 - 14.5 deg						
C	8.6 - 9.2 mm						

F1

ZEXEL - Test values

Injection pumps



F2

ZEXEL - Test values

Injection pumps



■ LOAD TIMER ADJUSTMENT

1. Adjustment

1) Fix the control lever in the position satisfying the following conditions:

Boost Pressure:                    -                    mmHg  
Pump Speed        :                    1200                    rpm  
Fuel Injection Quantity:    15.5 - 17.5                    cc/1000st

2) With the control lever positioned as described in 1) above, adjust the governor sleeve so that the Timer Stroke conforms to the specified values (item 1-7).

2. Confirmation of Timer Characteristics

Fix the control lever in the position satisfying the following conditions, and confirm the Timer Stroke.

Control lever position			Specified values	
Pump speed (rpm)	Fuel injection quantity (cc/1000st)	Boost pressure (mmHg)	Timer stroke (mm)	Timer stroke reduction value (mm)
1200	27.1 - 29.1	-	-	2.6 - 3.2
1200	13.0 - 15.0	-	-	1.2 - 2.2

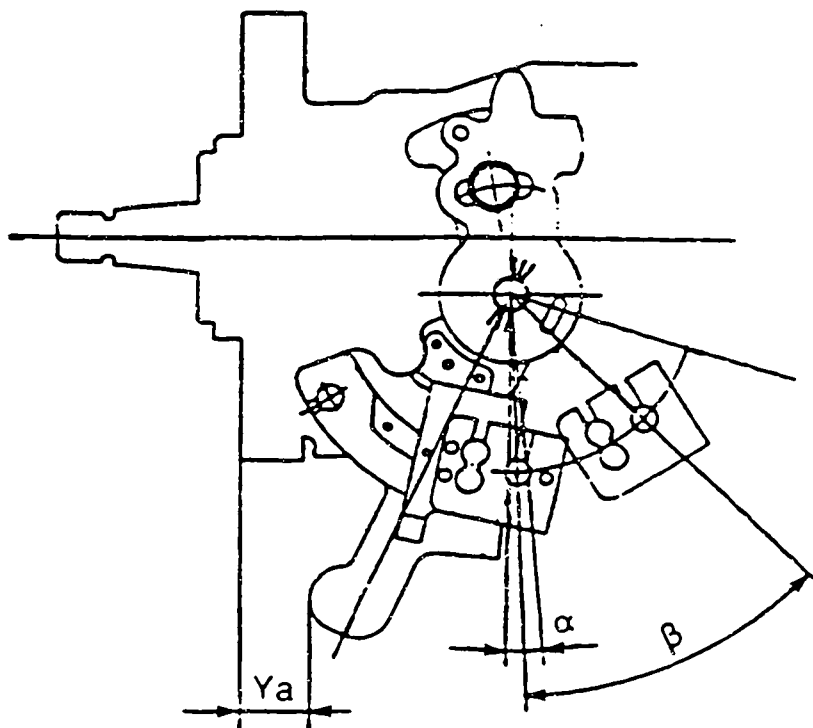


Figure 37

104748-2462 3/5

■ CONTROL LEVER ANGLE MEASUREMENT POSITION

1. Measure the control lever angles ( $\alpha$ ,  $\beta$ ,  $\gamma$ ) at hole "A".



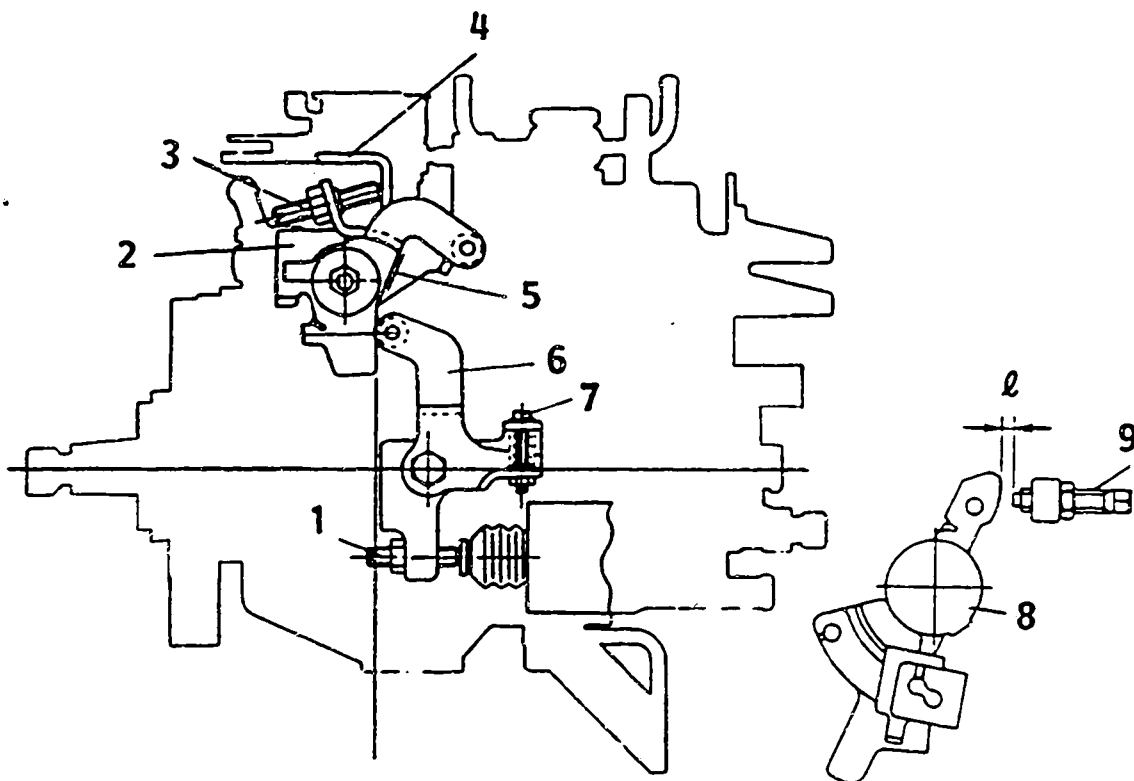


Figure 38

104748-2462 4/5

- 1 = Timer stroke adjusting screw
- 2 = Intermediate lever
- 3 = Intermediate lever set screw
- 4 = Control lever
- 5 = Aligning mark
- 6 = CSD lever
- 7 = Idling adjusting screw

- 8 = Control lever
- 9 = Idling stopper bolt

#### ■ W-CSD ADJUSTMENT

##### 1. Timer Stroke Adjustment (adjust to the thick line)

- 1) Calculate the timer stroke from Fig. 39 according to the atmospheric temperature at the time of adjustment.





**2. Intermediate Lever Position Adjustment (continued)**

- 1) Insert a block gauge (thickness gauge) of  $2.9 \pm 0.05$  mm thickness between the control lever and the idling stopper bolt.
- 2) Align the intermediate lever with the aligning mark.
- 3) Adjust the intermediate lever set screw so that the control lever and the intermediate lever set screw are in contact, and then fix in position using the locknut.

**3. CSD Lever Adjustment (adjust to the thick line)**

- 1) Calculate the block gauge dimension  $l \pm 0.05$  mm from (Fig. 39) according to the atmospheric temperature at the time of adjustment.
- 2) Insert the block gauge (thickness gauge) between the control lever and the idling stopper bolt.



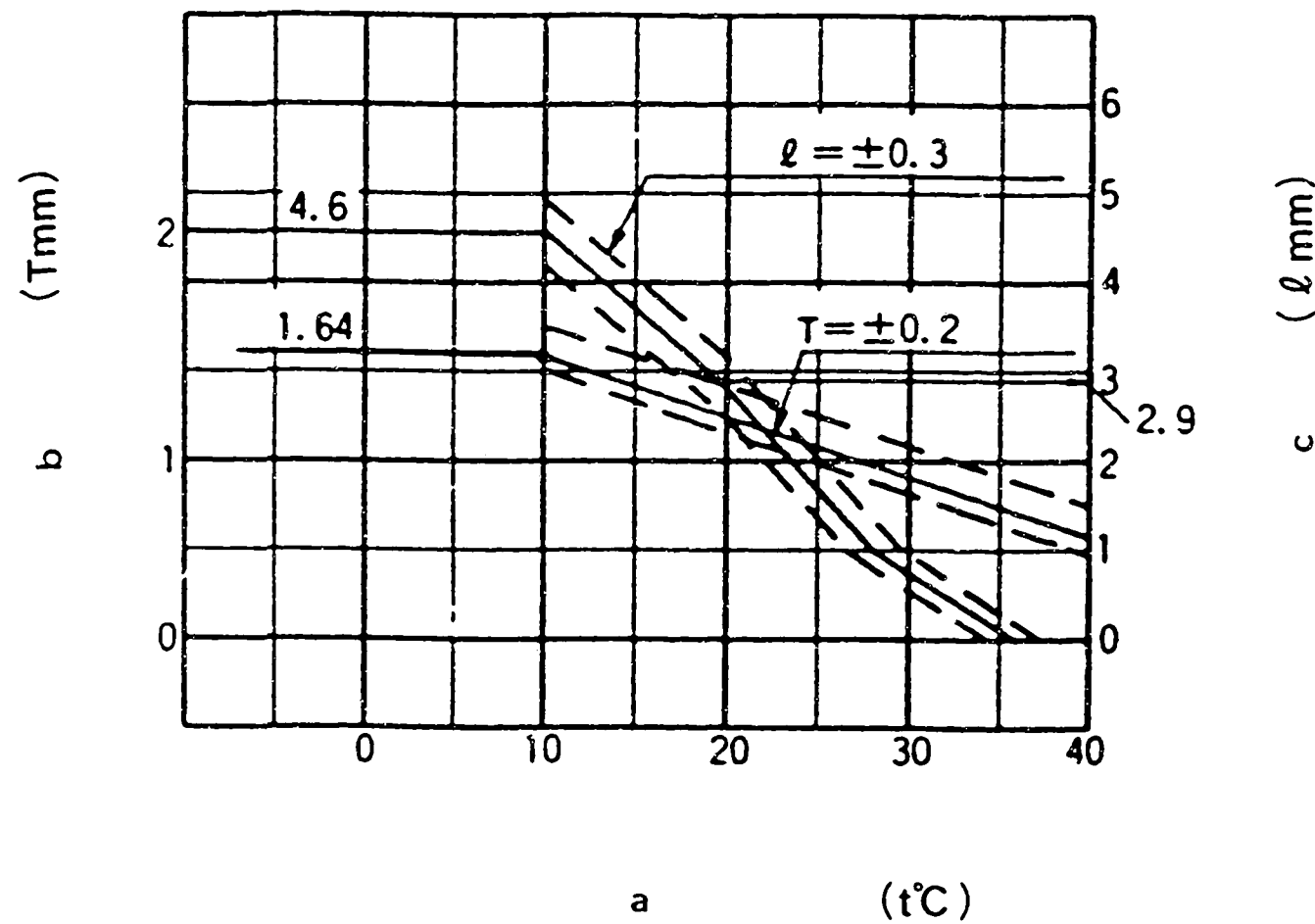


Figure 39

104748-2462 5/5

a = Atmospheric temperature  
b = Timer stroke  
c = Gap between control lever and  
idling stopper bolt

**Note:**

1. The temperature of the wax must be below 30°C when adjusting.
2. When inserting a block gauge (thickness gauge) between the control lever (bracket) and the idling stopper bolt, use the idling adjusting bolt to separate the CSD lever and the intermediate lever so that no excessive force is exerted on them.

$$10 \leq \theta \text{ (}^\circ\text{C)} \leq 20$$

$$TA = -0.355 \theta + 1.995$$

$$20 \leq \theta \text{ (}^\circ\text{C)} \leq 60$$

$$TA = -0.03515 Q + 1.988$$

$$\theta \text{ (}^\circ\text{C)} \leq 10$$

$$10 < \theta \text{ (}^\circ\text{C)} \leq 20$$

$$20 < \theta \text{ (}^\circ\text{C)} \leq 28.5$$

$$28.5 < \theta \text{ (}^\circ\text{C)} \leq 36$$

$$l = 4.6$$

$$l = -0.17 \theta + 6.3$$

$$l = -0.235 \theta + 7.6$$

$$l = -0.12 \theta + 4.32$$

**F8**

ZEXEL - Test values

Injection pumps



**F9**

ZEXEL - Test values

Injection pumps



Test oil:		ZEXEL - TEST VALUES			1/4	
ISO 4113 or		Distributor pumps			BOSCH No. 9 460 610 530	
SAE J967d		Engine model: LD20 (XP)			ZEXEL No. 104749-2200	
					Date: 31.05.1992 [0]	
					Company: NISSAN	
					No. 16700 05E11	
Injection pump no.: 104649-2200		(NP-VE4/9F2500RNP360)				
Pump rot.: Clockwise-viewed from drive side		Test-nozzle holder combination:		Test pressure line:		
		1 688 901 000		1 680 750 017		
1. Setting values		P. Speed (rpm)	Setting values	Charge-air pressure (mmHg)	Difference (cc)	
1-1	Timing device travel	900	1.3 - 1.7 (mm)		2.5	
1-2	Supply pump pressure	900	3.2 - 3.8 (kg/cm²)			
1-3	Full load delivery	900	32.5 - 33.5 (cc/1000st)			
	Full load delivery		(cc/1000st)			
1-4	Idle speed regulation	375	5.2 - 8.2 (cc/1000st)			
1-5	Start	100	40.0 - 50.0 (cc/1000st)			
1-6	Full-load speed regulation	2700	10.9 - 16.9 (cc/1000st)			
1-7	Load-timer adjustment	900	T-0.63-0.67 (mm)			
1-8						
2. Test values						
2-1	Timing device	N = rpm	900	1800	2300	
		mm	1.2 - 1.8	5.5 - 6.7	7.7 - 8.9	
2-2	Supply pump	N = rpm	900	1800	2500	
		kg/cm²	3.1 - 3.9	5.1 - 5.9	6.8 - 7.6	
2-3	Overflow delivery	N = rpm	900			
		cc/10s	35.0 - 79.0			
2-4 Fuel injection quantities						
Control lever position		Pump Speed (rpm)	Fuel delivery (cc/1000 strokes)	Charge-air pres (mmHg)	Difference (cc)	
End stop .		900	32.0 - 34.0			
		600	31.2 - 35.2			
		2300	30.6 - 34.6			
		2700	10.4 - 17.4			
		2800	below 6.0			
Switch off		375	0			
Idle stop		375	4.7 - 8.7	2.5		
		500	below 4.5			
Partial load		900	6.3 - 16.3			
2-5 Solenoid		Cut-in voltage max. 8V Test voltage: 12 - 14V				
3. Dimensions						
K	3.2 - 3.4 mm					
KF	5.7 - 5.9 mm					
MS	1.1 - 1.3 mm					
BCS	- mm					
Pre-str.	- mm					
Control lever angle						
α	21° - 29° deg					
A	7.6 - 11.7 mm					
β	37° - 47° deg					
B	11.2 - 14.9 mm					
γ	10.5 - 11.5 deg					
C	5.5 - 6.1 mm					

F10

ZEXEL - Test values  
Injection pumps



F11

ZEXEL - Test values  
Injection pumps



## 1. Adjustment

- 1) Fix the control lever in the position satisfying the following conditions:

Boost Pressure:	-	mmHg
Pump Speed :	900	rpm
Fuel Injection		
Quantity :	16.0 - 18.0	cc/1000st

- 2) With the control lever positioned as described in 1) above, adjust the governor sleeve so that the Timer Stroke conforms to the specified values (item 1-7).

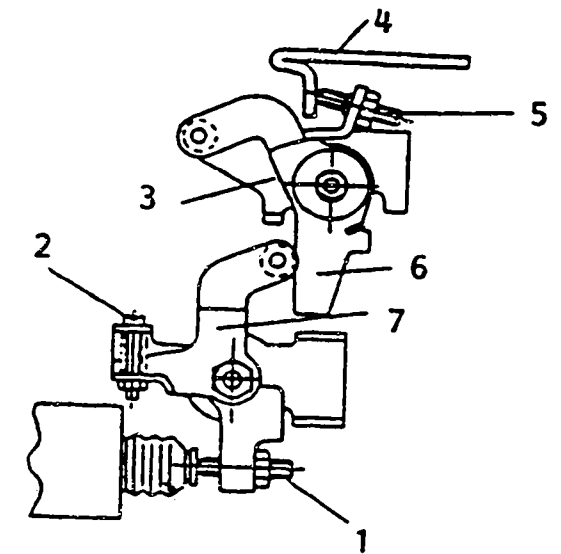
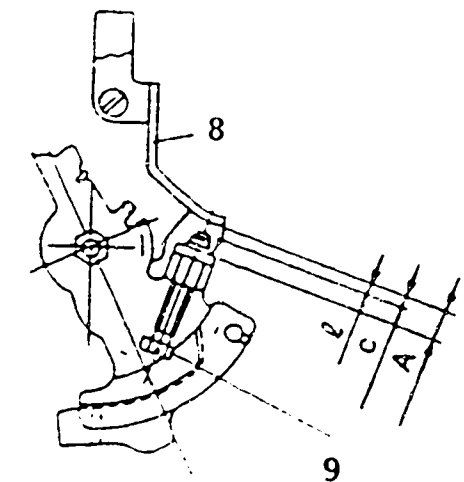


Figure 40

- 1 = Timer stroke adjusting screw  
 2 = Idling adjusting screw  
 3 = Aligning mark  
 4 = Control lever  
 5 = Intermediate lever set screw  
 6 = Intermediate lever  
 7 = CSD lever

- 8 = Bracket  
 9 = Idling stopper bolt



## W-CSD ADJUSTMENT

## 1. Timer stroke adjustment (adjust to the thick line)

- 1) Calculate the timer stroke from Fig. 41 according to the atmospheric temperature at the time of adjustment.
- 2) Adjust using the timer stroke adjusting screw so that the timer stroke is as calculated in Step 1).

## 2. Intermediate Lever Position Adjustment

- 1) Insert a block gauge (thickness gauge) of  $0.25 \pm 0.05$  mm thickness between the bracket and the idling stopper bolt.
- 2) Align the intermediate lever with the aligning mark.
- 3) Adjust the intermediate lever set screw so that the control lever and the intermediate lever set screw are in contact, and then fix in position using the locknut.



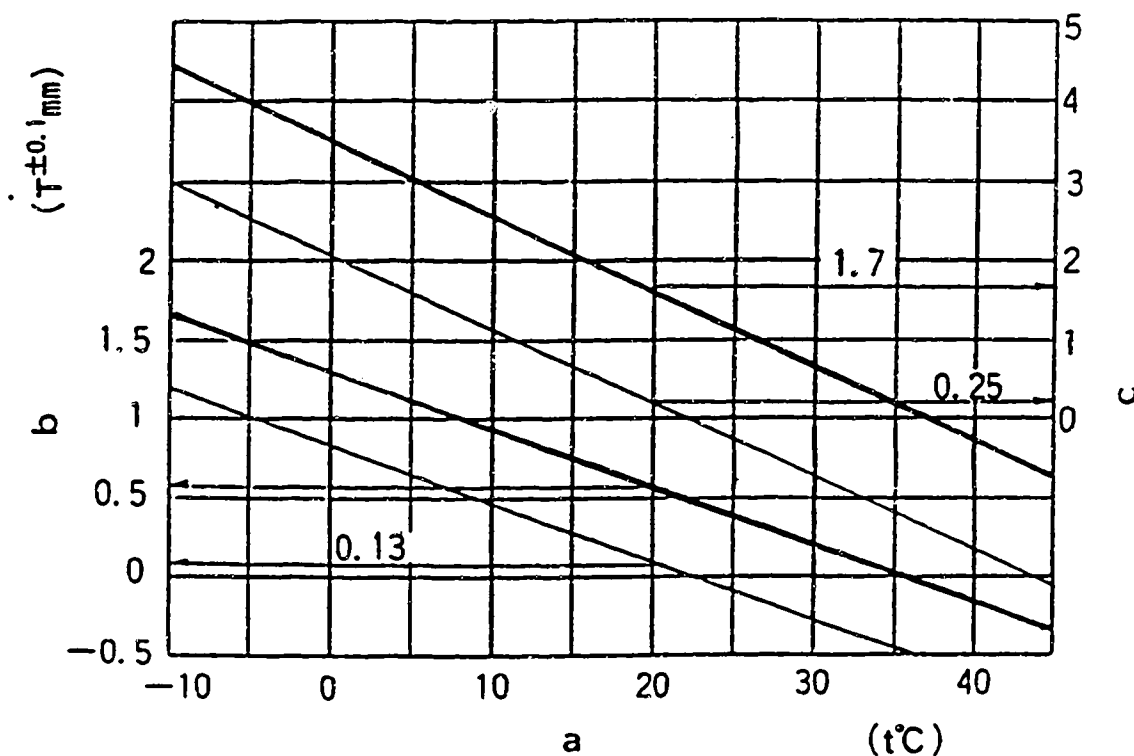


Figure 41

104749-2200 3/4

a = Atmospheric temperature

b = Timer stroke

c = Gap between control lever  
and idling stopper bolt

Thick line: For temporary adjustment

Thin line: For final adjustment

Formula for calculating (Figure 41)

Formula for calculating timer stroke:

$$T = -0.0367 t + 1.424$$

Formula for calculating control lever and idling  
stopper bolt gap:

$$l = -0.095 t + 3.6$$



(Continued)

### 3. CSD lever adjustment (adjust to the thick line)

- 1) Calculate the block gauge dimension  $l \pm 0.05$  mm from (Fig. 41) according to the atmospheric temperature at the time of adjustment.
- 2) Insert the block gauge (thickness gauge) selected in Step 1) between the bracket and the idling stopper bolt.
- 3) Using the idling bolt, adjust so that the CSD lever roller and the intermediate lever are in contact.

### 4. Final adjustment

After completing the adjustment, screw the timer stroke adjusting screw two turns clockwise.

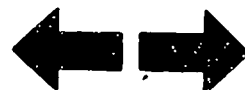
(Move from the temporary adjustment chart to the final adjustment chart).

- \* This W-CSD's timer stroke operations are effective at atmospheric temperatures of 27°C or above.

Therefore, to make adjustment at normal temperatures possible, after adjusting to the substitute characteristics, tighten the timer stroke adjusting screw two turns.

#### Note:

1. The temperature of the wax must be below 30°C when adjusting.
2. When inserting a block gauge (thickness gauge) between the control lever (bracket) and the idling stopper bolt, use the idling adjusting bolt to separate the CSD lever and the intermediate lever so that no excessive force is exerted on them.



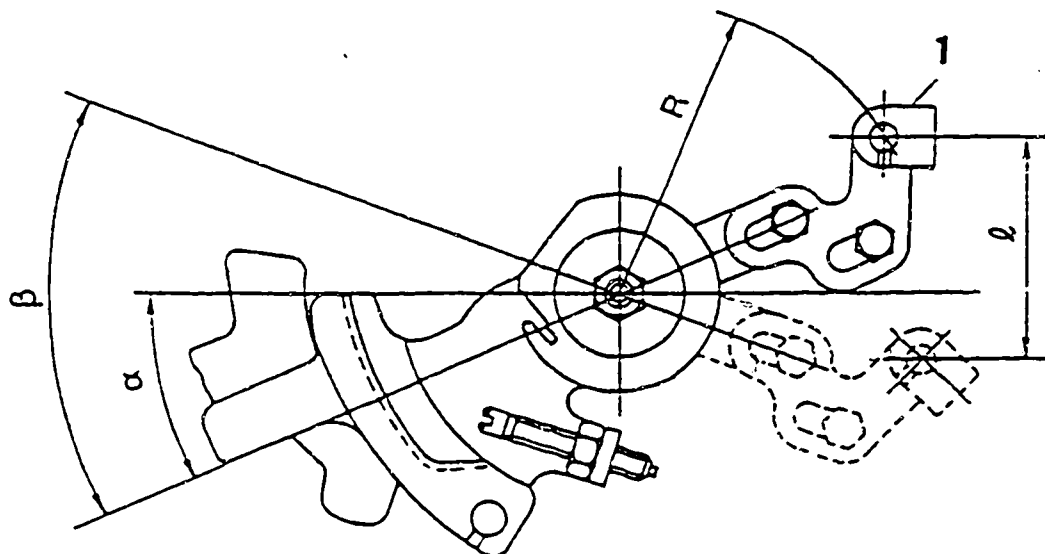


Figure 42

104749-2200 4/4

1 = Plate

# ■ ACCELERATOR CABLE PLATE INSTALLATION

Set the installation position for the plate, as shown above, according to the control lever angle (angle  $\beta$ ).

$36^\circ$	$\leq \beta < 38.5^\circ \Rightarrow$	$R = 64 \text{ mm}$ (The plate is in outermost position)
$38.5^\circ$	$\leq \beta \leq 43.5^\circ \Rightarrow$	Adjust using R so that $l = 41.5 \pm 0.9 \text{ mm}$
$43.5^\circ$	$< \beta \leq 46.0^\circ \Rightarrow$	$R = 57 \text{ mm}$ (The plate is in innermost position)

\* Measure " $l$ " parallel to the centre line of the pump



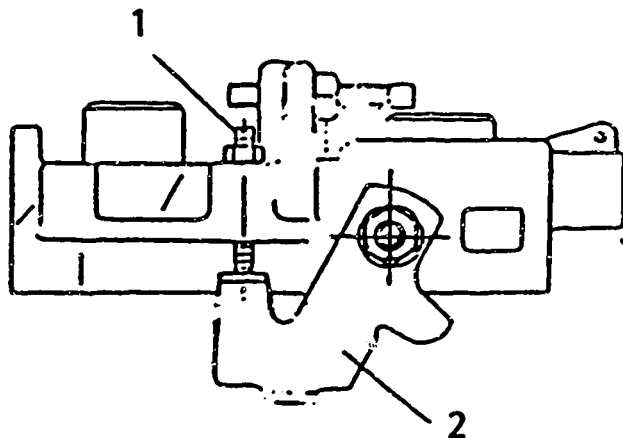


Figure 43

4749-2200 4/4

(Continued)

- 1 = Adjusting screw
- 2 = Stop lever

#### ■ ADJUSTMENT OF STARTING INJECTION QUANTITY

Adjust the starting injection quantity  
(item 1-5) using the adjusting screw.





# ZEXEL - TEST VALUES

## Injection pumps

BOSCH No.	:	9 400 610 158	1/5
ZEXEL No.	:	106661-5390	
Date	:	30.05.1992	[4]
Company	:	NISSAN DIESEL	
Engine	:	PE6T / 16790-96513	

IP-Type number	:	106066-1300 / PE6A
Governor type number	:	105407-3990 / EP/RSV

### TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure bar	:	1.6
Test nozzle holder combination	:	1 688 901 013
Opening pressure bar	:	175
Test pressure line	:	
Inner x Outer Dia - Length mm	:	3.00 x 8.00 x 600

### PORT CLOSING

Prestroke	mm	:	3.2 ± 0.05
Rod position	mm	:	-
Port closing mark Cyl. No.	:	:	-
Cam sequence	:	:	1-4-2-6-3-5
Port closing mark Cyl. No.	:	:	-
Port closing difference °NW	:	:	0-60-120-180-240-300
Tolerance	+- °C	:	0.50 (0.75)

**G1**

ZEXEL - Test values

Injection pumps



## Injection Quantity :

Adjusting Point	Rod Pos. (mm)	Speed (rpm)	Injection Q'ty (cc/1000 str.)	Difference (%)	Fixed	Remarks
A	11.5	750	147.6 - 151.6	$\pm 4$	Rack	Basic
H	approx. 6.1	225	10.0 - 12.0	$\pm 10$	Rack	
A	11.5	750	147.6 - 151.6	-	Lever	Basic Boost pressure above 350 mmHg
B	11.5	1050	(148.2 - 154.2)	-	Lever	Basic Boost pressure above 350 mmHg
C	10.3	300	110.5 - 116.5	-	Lever	

Timing Advance Specification: EP/SA  
105614-4320

Speed (rpm)	below 400	350	900	1100			
Advance Angle (deg)	START	below 0.5	2.0-3.0	Finish 3.5-4.5			

**G2**

ZEXEL - Test values  
Injection pumps

**G3**

ZEXEL - Test values  
Injection pumps



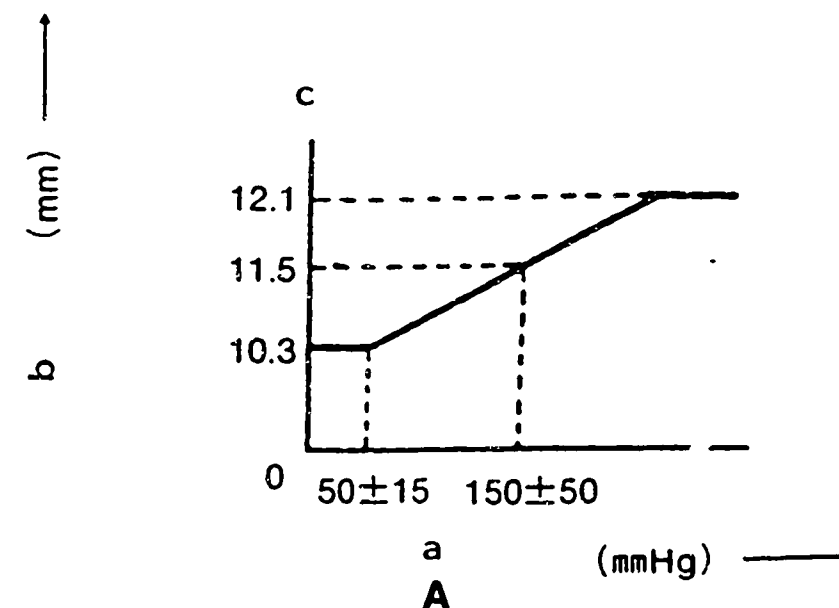
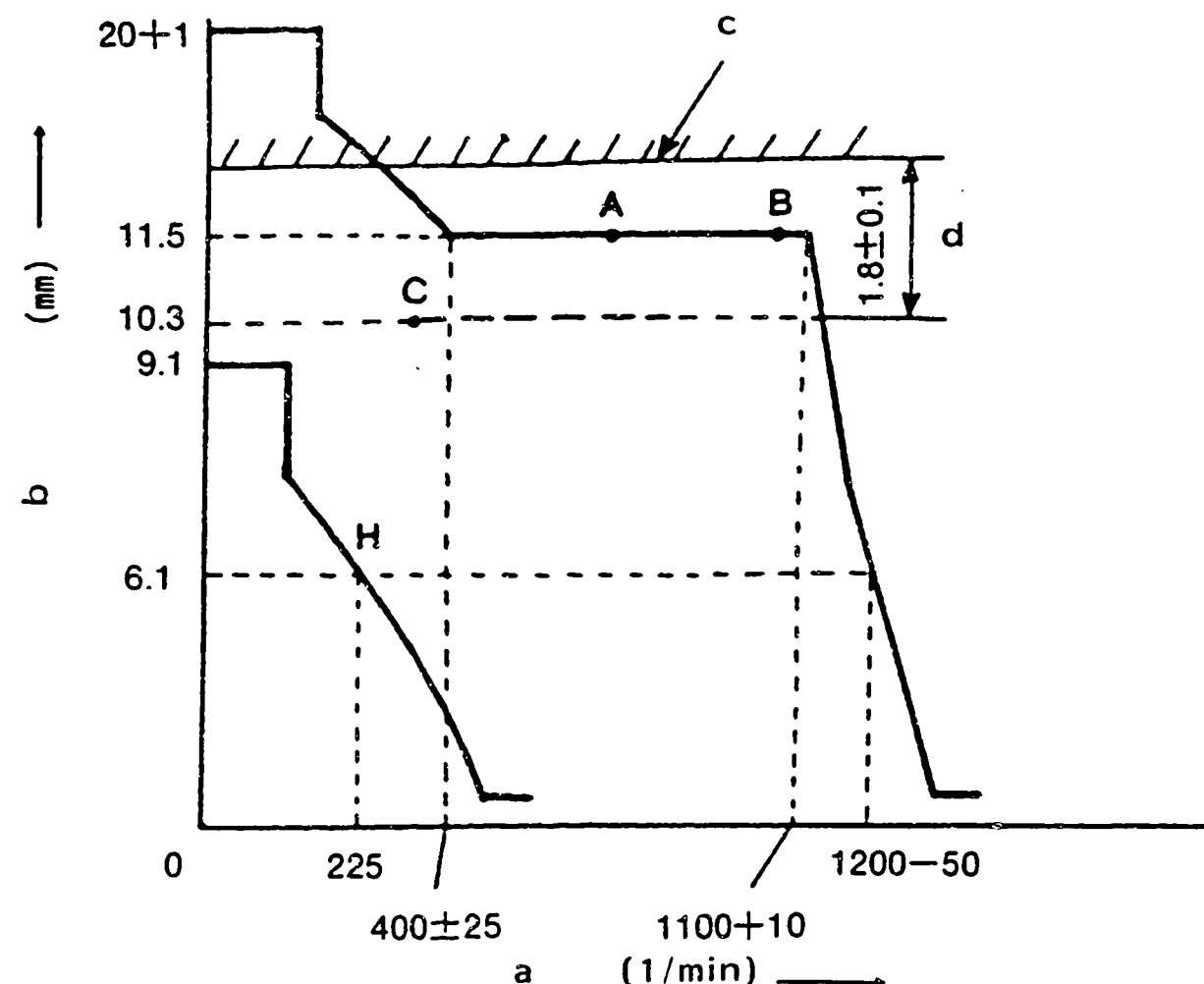


Figure 44 GOVERNOR ADJUSTMENT

106661-5390 2/5

Recommended speed droop adjustment screw position: 18

a = Pump speed  
b = Control rack position  
c = Excessive fuel lever setting for starting  
d = Boost compensator stroke

A = Boost Compensator Adjustment

B = Control Lever Angle

a = Boost pressure  
b = Rack position  
c = perform at 500 rpm

a = Full-speed  
b = Idling

G4

ZEXEL - Test values  
Injection pumps



G5

ZEXEL - Test values  
Injection pumps



## FINAL ADJUSTMENT

Depending on the injection pump's distinguishing mark, the final set values are shown below.

## Full-load fuel injection quantity

Mark	Pump Speed (r.p.m)	Average Fuel Injection Quantity (cc/1000st)	Maximum Variation (%)
A	750	152,0 ± 2	± 4
B	750	149,6 ± 2	± 4
C	750	139,0 ± 2	± 4
D	750	120,1 ± 2	± 4

## Governor Setting Adjustment

Mark	Pump Speed (r.p.m)	NO-Load-Maximum Speed (r.p.m)
23	1150	1235 ± 28
22	1100	1180 ± 27
21	1050	1130 ± 26
20	1000	1075 ± 25
19	950	1020 ± 23
18	900	965 ± 22
17	850	915 ± 22
16	800	860 ± 20
15	750	805 ± 18
14	700	750 ± 17
13	650	695 ± 16
12	600	645 ± 15

**G6**

ZEXEL - Test values  
Injection pumps

**G7**

ZEXEL - Test values  
Injection pumps



## ■ Note

- Before adjustment, remove the idling sub spring and the torque control spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 - 1.0 mm.

## ■ ADJUSTMENT

	Pump speed (rpm)	Rack position (mm)	Remarks
Full-load Adjustment (Temporary)	1100 - 1110 1050	11.5 11.5	<ul style="list-style-type: none"> <li>• Adjust using screw (2)</li> <li>• Adjust using screw (1)</li> </ul>
Torque Control Spring Adjustment			<ul style="list-style-type: none"> <li>• Adjust using spring capsule (4)</li> <li>• Confirm</li> <li>• Confirm</li> <li>• Confirm the torque control stroke is (mm)</li> </ul>
Idling Adjustment	0 225 -	9.1 6.1 -	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Adjust using spring capsule (5)</li> <li>• Confirm</li> </ul>
Maximum-speed Adjustment	1100 - 1110 1150 - 1200	11.5 6.1	<ul style="list-style-type: none"> <li>• Fix the control lever</li> <li>• Confirm speed droop</li> <li>• Adjust using screw (3)</li> <li>• Confirm</li> </ul>
Full-load Adjustment (install the cover on governor cover)	1150 750	11.5 11.5	<ul style="list-style-type: none"> <li>• Adjust using screw (1)</li> <li>• Confirm</li> </ul>
Control Lever Angle Measurement	<ul style="list-style-type: none"> <li>• Measure the control lever angle at the "idling" and "full" positions.</li> <li>• When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>		
Excessive fuel lever setting for starting	500	12.0 - 12.2	<ul style="list-style-type: none"> <li>• Adjust using excessive fuel lever</li> </ul>

G8

ZEXEL - Test values

Injection pumps



G9

ZEXEL - Test values

Injection pumps



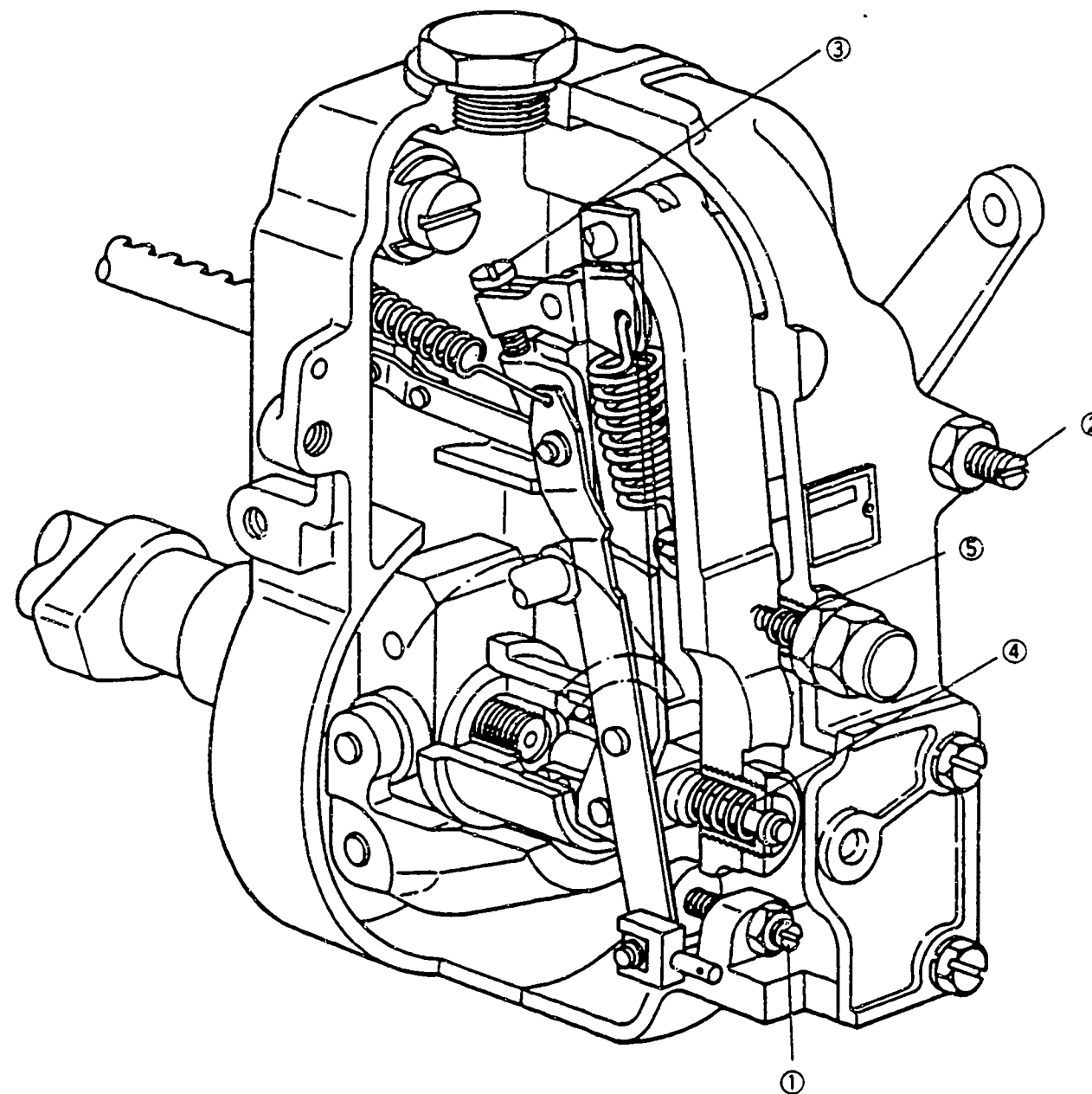


Figure 45

- 1 = Screw
- 2 = Screw
- 3 = Screw
- 4 = Spring capsule
- 5 = Spring capsule

106661-5390 4/5

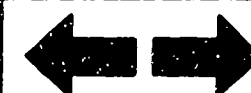
**G10**

ZEXEL - Test values  
Injection pumps



**G11**

ZEXEL - Test values  
Injection pumps



- Maintain the pump speed at 500 rpm and fix the control lever in the full load position.

	Boost pressure (mmHg)	Rack position (mm)	Remarks
Boost compensator stroke adjustment	0	12.1 → 10.3	<ul style="list-style-type: none"> <li>• Adjust using screw (7)</li> </ul>
Boost compensator spring adjustment	100 - 200 35 - 65 12.1	11.5 10.3 -	<ul style="list-style-type: none"> <li>• Adjust using screw (6)</li> <li>• Confirm</li> <li>• Confirm</li> </ul>

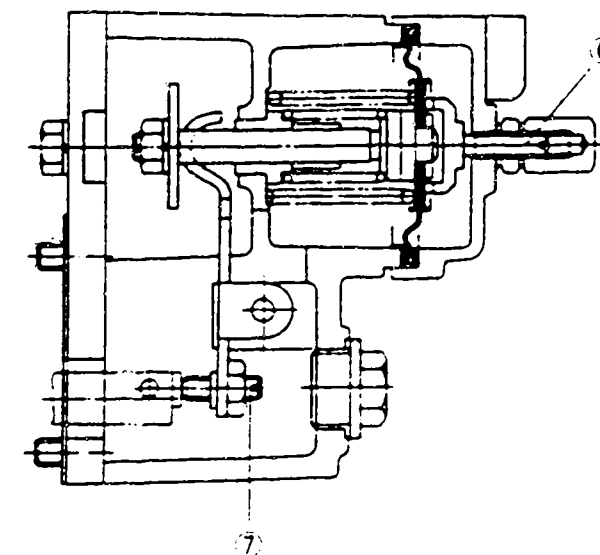


Figure 46

6 = Screw

7 = Screw

# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 168	1/4
ZEXEL No.	:	106672-9541	
Date	:	30.05.1992	[3]
Company	:	KOMATSU	
Engine	:	S6D155 /6127-71-1151	

IP-Type number	:	106060-7580 /PES6P
Governor type number	:	105447-0671 /EP/RSUV

## TEST PREREQUISITES

Test oil	:	ISO-4113
Test oil inlet temperature °C	:	40.00...45.00
Inlet pressure bar	:	1.6
Test nozzle holder combination	:	0 681 343 002
Opening pressure bar	:	175
Test pressure line	:	
Inner x Outer Dia - Length mm	:	3.00 x 8.00 x 600

## PORT CLOSING

Prestroke	mm	:	2.5 ± 0.05
Rod position	mm	:	-
Port closing mark Cyl. No.	:	:	-
Cam sequence	:	:	1-5-3-6-2-4
Port closing mark Cyl. No.	:	:	-
Port closing difference °NW	:	:	0-60-120-180-240-300
Tolerance	+ - °C	:	0.50 (0.75)

